CHAPTER 21
Toxicology

INTRODUCTION
• Each day, we come into contact with things that are potentially poisonous.
• Acute poisoning affects 2 ________________ people each year.
• Chronic poisoning is more common.
  • Deaths in adults have been rising as a result of drug abuse.

DEFINITIONS
• **Toxicology**: the study of toxic or ________________ substances
• **Poison**: any substance whose chemical action can damage body structures or impair body functions.
• **Toxin**: a poisonous substance produced by bacteria, animals, or plants
• **Substance Abuse**: the misuse of any substance to produce a desired effect.
• **Overdose**: a ________________ dose of a drug

CONSIDER POISONING IN PATIENTS WITH:
• Gastrointestinal S/S
• Altered LOC, Seizures, Unusual Behavior
• Disturbed ________________ Nervous System
  • Pupil changes, salivation, diaphoresis
• Respiratory Depression
• Burns, Blisters of Lips or Mucous Membrane
• Vague or allusive history

IDENTIFYING THE PATIENT AND THE POISON
If you suspect poisoning, ask the patient the following questions:
• What substance did you take?
  • ________________ did you take it (or become exposed to it)?
• How much did you ingest?
• Has an antidote been given since ingestion?
• How much do you weigh?
• Did you have anything to eat or drink before or after you took it?

6 DETERMINING THE NATURE OF THE POISON
• Take suspicious materials, ______________________, and vomitus to the hospital.
• Provides key information on:
  - Name and concentration of the drug
  - Specific ingredients
  - Number of pills originally in bottle
  - Name of ______________________
  - Dose that was prescribed

7 POISON CONTROL CENTERS
• Staff have information on most substances.
• Center has information on emergency treatments and antidotes.
• If poison control is contacted, gain permission for treatment from medical ______________________
• 1-800-764-7661
• Can provide guidance but CANNOT provide medical direction or give orders to EMS

8 ROUTES OF POISONINGS
• Ingestion: By ______________________
• Inhalation: Breathing in gases, toxins, or chemicals
• Injection: Mostly from deliberate drug overdose
• ______________________: Corrosive substances that contact the skin
• All routes can be deadly

9 HOW POISONS GET INTO THE BODY

10 INGESTED POISON (1 OF 3)
• Poison enters the body by mouth.
• Accounts for 80% of poisonings
  • Drugs
    • ______________________
Household cleaners
Contaminated food
Plants

11 INGESTED POISONS (2 OF 3)
• Usually accidental in children and deliberate in adults
• Signs and symptoms vary greatly with the:
  • Type of poison
  • Age of the patient
  • ___________________________ that has passed since ingestion

12 MANAGEMENT OF INGESTED POISONS (1 OF 3)
• Goal is to rapidly remove as much poison as possible from the GI tract.
  • Further care will be provided at the emergency department
• In the past, syrup of __________________________ was used to induce vomiting.
  • Generally not used today

13 MANAGEMENT OF INGESTED POISONS (2 OF 3)
• Assess __________________________.
• Prepare for vomiting
• Activated charcoal may be indicated.
  • Will bind with poison to decrease potency and expedite removal
  • Consult with medical direction

14 MANAGEMENT OF INGESTED POISONS (3 OF 3)
• Signs and symptoms may include burns around the mouth, gastrointestinal pain, vomiting, cardiac dysrhythmias, or seizures.
• Treat signs and symptoms and notify the poison __________________________ and medical control.
• Consider if there is unabsorbed poison in the gastrointestinal tract and whether you can safely prevent its absorption.
ACTIVATED CHARCOAL (1 OF 2)

- Charcoal is not indicated for:
  - Ingestion of an acid, ________________________, or petroleum
  - Patients with decreased level of consciousness
  - Patients who are unable to swallow

- Usual dosage (1g/kg)
  - ______________________ to ______________________ g for adults
  - 12.5 to 25 g for pediatric patients.

ACTIVATED CHARCOAL (2 OF 2)

- Obtain approval from medical control.
- Shake bottle vigorously.
- Ask patient to drink with a ______________________ .
  - You may have to persuade the patient to drink
- Record the time you administered the activated charcoal.
- Be prepared for vomiting.

INHALED POISONS (1 OF 3)

- Move to fresh air immediately.
- The patient may require supplemental ______________________ .
- All patients require immediate transport.
- Hypoxia is greatest danger
- Some poisons may require ______________________
- If you suspect the presence of a toxic gas, call for the HazMat team

INHALED POISONS (2 OF 3)

- Carbon Monoxide Poisoning
  - Colorless, tasteless, and odorless gas
  - Produced by ______________________ combustion
  - Binds to hemoglobin 200 times more readily than oxygen
  - S/S: N/V, headache, “roaring” in ears, seizures, coma, and cherry red skin
- Suspect respiratory burns
- Pulse ox may register CO saturation
19 INHALED POISONS (3 OF 3)
• Some patients use inhaled poisons to commit suicide in a vehicle.
  • ______________________ fumes contain high levels of carbon monoxide.
  • Chemicals or detergent in a tightly sealed vehicle create a type of gas chamber.
  • When you open the door, you may be overcome as well.
  • Contact hazardous materials responders and have them remove the victim.

20 INJECTED POISONS (1 OF 2)
• Exposure by injection includes intravenous drug abuse and envenomation by insects, arachnids, and reptiles.
• Signs and symptoms may include:
  • Weakness
  • ______________________
  • Fever/chills
  • Unresponsiveness
  • Excitability

21 INJECTED POISONS (2 OF 2)
• Impossible to remove or dilute poison once injected
  • Usually absorbed quickly into the body
  • Can cause intense local tissue destruction
• Monitor the airway, provide high-flow oxygen, be alert for nausea and vomiting, and transport promptly.

22 CARE FOR INJECTED POISONINGS
• Try to slow absorption
  • Venous constricting bands
  • Cold Packs
  • Splinting
  • Remove ______________________ if swelling starts
• Monitor airway and respirations
• ABCs and prompt transport
23 □ **ABSORBED POISONS (1 OF 2)**
   • Many substances will damage the skin, mucous membranes, or ____________________.
   • Substance should be removed from patient as rapidly as possible.
   • If substance is in the eyes, they should be irrigated.
   • Do not irrigate with water if substance is reactive.

24 □ **ABSORBED POISONS (2 OF 2)**
   Signs and symptoms include:
   • A history of exposure
   • Liquid or powder on a patient’s skin
   • ____________________
   • Itching
   • Irritation
   • Typical odors of the substance
   • Redness of skin
   
25 □ **TREATMENT OF ABSORBED POISONINGS (1 OF 3)**
   • Avoid contaminating yourself or others.
   • While protecting yourself, remove substance from patient as rapidly as possible.
   • Remove all ____________________ clothing.
   • Flush and wash the skin.
   • Avoid using “neutralizing” agents
   
26 □ **TREATMENT OF ABSORBED POISONINGS (2 OF 3)**
   • Try to obtain Material Safety Data Sheet (MSDS) of substance
   • If in eyes flush continuously
     • 5 to 10 minutes for acid substances
     • 15 to 20 minutes for alkalis
   • If dry material, brush off as much as possible then flush with ____________________ amounts of water
   
   •
   •
   •
27  TREATMENT OF ABSORBED POISONINGS (3 OF 3)
   • If chemical is water reactive:
     • Brush the chemical off.
     • Remove contaminated clothing.
     • Apply a ________________ dressing to the burn area.
   • In all cases involving flushing the skin, assure adequate water supply

28  ABSORBED POISONINGS IN INDUSTRIAL SETTING
   • Safety showers and specific protocols may be available.
   • ________________ team should be available to assist you.
   • Ensure that you, your team, and the patient are thoroughly decontaminated.
   • Obtain material safety data sheets.

29  GENERAL CARE OF POISONINGS (1 OF 2)
   • Ensure scene safety
     • Criminal activity involving illegal drugs
     • Hazardous conditions
     • ________________ attempts
   • Treat the patient, not the poison.
   • Rule out trauma.
   • Hi-Con oxygen.
   • Bring in sample of poison if possible.

30  GENERAL CARE OF POISONINGS (2 OF 2)
   • Save emesis for analysis.
   • Contact Poison Control and Medical Control
   • If amount taken cannot be determined, assume all missing content was taken
   • Remove tablets or fragments from the patient’s ________________ .
   • Wash or brush the poison from the patient’s skin.

31  EMERGENCY MEDICAL CARE
   • External decontamination is important.
   • Care focuses on support: assessing and maintaining
Care focuses on support: assessing and maintaining ____________________.

You may be permitted to give activated charcoal for ingested poisons.

Contact medical control or follow protocols

32 SUBSTANCE ABUSE TERMS

• **Drug**: substance for preventing or treating of diseases or enhancement of the welfare of humans or animals.

• ________________ : An overwhelming desire or compulsion to continue using the drug.

• **Dependency**: physical and psychological state in which the drug is required to prevent withdrawal

• **Tolerance**: Increasing resistance to a drug

33 ALCOHOL (1 OF 4)

• Most commonly abused drug in the US

• Kills more than ________________ people a year

• Alcohol is a powerful CNS depressant.

• Acts as a sedative and hypnotic

• A person that appears intoxicated may have a medical problem.

34 ALCOHOL (2 OF 4)

• Alcohol is a powerful CNS ________________ .

• Decreases activity and excitement

• Induces sleep

• Dulls the sense of awareness, slows reflexes, and reduces reaction time

• May cause aggressive and inappropriate behavior and lack of coordination

• Alcohol increases the effects of other drugs and is commonly taken with other substances

35 ALCOHOL (3 OF 4)

• Intoxicated patients should be transported and seen by a physician.

• If patient shows signs of serious CNS depression, provide ________________ support.

• Patients may also experience hypoglycemia, trauma, internal bleeding, respiratory depression, and shock.

• A patient with alcohol withdrawal may experience delirium tremors (DTs).
ALCOHOL (4 OF 4)
Patients with DTs may experience:
• Agitation and restlessness
• Fever
• ______________________________
• Confusion and/or disorientation
• Delusions and/or hallucinations
• Seizures

CARE FOR ETOH PATIENTS
• Use caution, protect yourself
• Check closely for other illnesses or injury
  • Complete history and head to toe as needed
• Alcohol combines with other medications.
  • Suspect other medications or substances
• Treat patient with same care as others.
  • ______________________________ airway.
• Protect from vomiting.

OPIOIDS (NARCOTICS) (1 OF 3)
• Drugs containing opium from the poppy seed
• Most of these, such as codeine, Morphine, Darvon, and Percocet, have medicinal purposes.
• The exception is heroin, which is illegal.
• Opioids are ______________________________ depressants causing severe respiratory distress and constricted (pinpoint pupils).

OPIOIDS (NARCOTICS)
(2 OF 3)
• Care includes supporting airway and breathing.
• You may try to wake patients by talking loudly or shaking them gently.
• Always give supplemental oxygen and prepare for vomiting.
• Request for ______________________________ back up for administration of a narcotic antagonist (Narcan).

OPIOIDS (NARCOTICS) (3 OF 3)
• Opioid dependency can occur after taking a medical prescription.
• Opioids are CNS depressants and can cause severe respiratory 
____________________.
• Tolerance develops quickly.
• Often cause nausea and vomiting
• May lead to hypotension
• Patients typically appear unconscious and cyanotic with pinpoint 
pupils.

41 SEDATIVE-HYPNOTIC DRUGS (BARBITURATES) (1 OF 2)
• These drugs are CNS depressants and alter level of consciousness.
• Patients may have severe respiratory depression and even 
____________________.
• The main concern is to ensure airway is patent, assist ventilation, and 
provide prompt transport.
• IV sedative-hypnotic drugs quickly induce tolerance.

42 SEDATIVE-HYPNOTIC DRUGS (BARBITURATES) (2 OF 2)
• Withdrawal may be life threatening
• Treatment is to support airway and breathing
• The antidote (____________________) may be administered in the 
hospital.

43 ABUSED INHALANTS (1 OF 3)
• Common household products inhaled by teenagers for a “high”
• Called “____________________”
• Effects range from mild drowsiness to coma
• May often cause seizures

44 ABUSED INHALANTS (2 OF 3)
These agents are inhaled instead of ingested or injected:
• Acetone, toluene, xylene, hexane
  • Found in glues, cleaning compounds, paint 
  ________________________, and lacquers
• Gasoline and halogenated hydrocarbons are also abused.

45  ABUSED INHALANTS (3 OF 3)
• Halogenated hydrocarbon solvents can make the heart hypersensitive to the patient’s own adrenaline.
• Even the action of walking may cause a fatal ventricular ________________ and cardiac arrest.
• Give oxygen and use a stretcher to move patient.
• Prompt transport is essential.

46  HYDROGEN SULFIDE (1 OF 2)
• Hydrogen sulfide
  • A highly toxic, colorless, and flammable gas with a distinctive ________________ odor
  • Affects all organs, but it has the most impact on the lungs and CNS.
  • Used to commit suicide
  • If you suspect the presence of a toxic gas, wait for a HazMat team to tell you the scene is safe.

47  HYDROGEN SULFIDE (2 OF 2)
• Signs and symptoms:
  • Nausea and vomiting, confusion, ________________, loss of consciousness, seizures, shock, coma, and cardiopulmonary arrest.
  • Once the patient has been decontaminated, management is largely supportive.
  • Monitor and assist the patient’s respiratory and cardiovascular functions.
  • Provide rapid transport.

48  SYMPATHOMIMETICS
• CNS ________________ that mimic the effects of the sympathetic (flight or flight) nervous system
• Cause hypertension, tachycardia, and dilated pupils.
• Amphetamine and methamphetamine are commonly taken by mouth.
• Cocaine can be taken in many different ways.
  • Can lead to seizures and cardiac disorders
• Be aware of personal safety.

STREET NAMES FOR SYMPATHOMIMETICS

SYMPATHOMIMETICS

SYNTHETIC CATHINONES (BATH SALTS) (1 OF 2)

SYNTHETIC CATHINONES (BATH SALTS) (2 OF 2)

MARIJUANA (1 OF 3)
• Marijuana is abused throughout the world.
  • THC is the chemical in the marijuana plant that produces its high.
  • Produces ________________ , relaxation, and drowsiness
  • Impairs short-term memory and the capacity to do complex thinking
  • Could progress to depression and confusion
• High doses may cause hallucinations, anxiety, or paranoia.

MARIJUANA (2 OF 3)
• Marijuana may be used as a vehicle to get other drugs into the body.
• Several states have legalized the recreational use of marijuana, and others allow for the medical use of products that contain THC.
  • “Edibles” infused with marijuana
  • Ingestion of marijuana can lead to cannabinoid ________________ syndrome

MARIJUANA (3 OF 3)
• Synthetic marijuana or “__________________________ ”
  • Refers to a variety of herbal incense or smoking blends that resemble THC and produce a similar high
  • Powerful and unpredictable effects may result, ranging from simple euphoria to complete loss of consciousness.

HALLUCINOGENS (1 OF 2)
• Alter an individual’s sense of perception
• LSD and ________________ are potent hallucinogens.
• Sometimes, people experience a “bad trip.”
• Patient typically are hypertensive, tachycardic, anxious, and paranoid.

57  HALLUCINOGENS (2 OF 2)
• Use extreme caution
• Use a calm, professional manner and provide emotional support.
• Only restrain if ______________________ of injury exists.
• Watch the patient carefully during transport.
• Request ALS assistance when appropriate.

58  ANTICHOLINERGICS
• “Hot as a hare, blind as a bat, dry as a bone, red as a beet, and mad as a hatter”
• Block the parasympathetic nerves
• ______________________, Benadryl, Jimson weed, and amitriptyline
• Patient may go from “normal” to seizure to death within 30 minutes.
• Treat ABCs and consider ALS backup.

59  CHOLINERGIC AGENTS
• Commonly used as nerve agents for ______________________
• Overstimulate body functions controlled by the parasympathetic nervous system
• Organophosphate insecticide or wild mushrooms are also cholinergic agents.
• S/S produce DUMBELS/SLUDGE

60  S/S OF CHOLINERGIC POISONING
1  DUMBELS
• D Diarrhea
• ______________________
• U ______________________
• M Miosis (tears)
• B Bronchorrhea, bradycardiam bronchospasm
• E Emesis
• L Lacrimation
• S ______________________, seizures, sweating

2  SLUDGEM
• S Salivation, sweating
• L Lacrimation
• **U** Urination
• **D** Defecation, drooling, diarrhea
• **G** GI irritation
• **E** ____________________
• **M** Muscle twitching

### CARE FOR CHOLINERGIC POISONING (1 OF 2)
• Main concern is to avoid exposure
• May require field decontamination
• Priority after decontamination is to decrease the _________________ in the mouth and trachea.
• Provide airway support.
• May be treated as a HazMat incident
• Contact Paramedic backup

### CARE FOR CHOLINERGIC POISONING (2 OF 2)
Antidote kits may be available:
• ____________________ I kit, DuoDote kit
• Indications include a known exposure to nerve agents or organophosphates with manifestation of signs and symptoms.
• The kit consists of an auto-injector of atropine and one of 2-PAM chloride.

### ASPIRIN
• Signs and symptoms of OD
  • Nausea/vomiting
  • Hyperventilation
  • Ringing in ears
  • ____________________
  • Seizures
• Patients should be transported quickly to the hospital.

### ACETAMINOPHEN
• Overdosing is ____________________.
• Generally not acutely toxic
• Symptoms may not appear until it is too late.
• Liver failure may not be apparent for a full week.
• Gathering information at the scene is very important.

65 OTHER ALCOHOLS
• Methyl alcohol and ethylene glycol are more toxic than ethyl alcohol.
• May be taken by chronic alcoholics who cannot obtain drinking alcohol
• More often taken by someone attempting __________________________
• Immediate transport is essential.

66 GERIATRIC NEEDS
• Patient may become confused about medications and experience an accidental overdose.
• Elderly patient may __________________________ overdose in an attempt to commit suicide.
• Exposures may have increased effects due to changes in various systems of the body.

67 FOOD POISONING
• *Salmonella bacterium* causes severe GI symptoms within 72 hours.
• *Staphylococcus* is a common bacteria that grows in foods kept too long.
• __________________________ often results from improperly canned foods.

68 SALMONELLA
• Characterized by severe GI symptoms within __________________________ hours of ingestion, including nausea, vomiting, abdominal pain, and diarrhea
• Proper cooking kills bacteria, and proper cleanliness in the kitchen prevents the contamination of uncooked foods.

69 STAPHYLOCOCCUS
• The more common cause of food poisoning is the ingestion of powerful toxins produced by bacteria, often in leftovers.
• Quick to grow and produce toxins in food.
• Foods prepared with mayonnaise, when left unrefrigerated, are a common vehicle.
• Produces extreme ___________ symptoms

70 □ BOTULISM
• The most severe form of toxin ingestion
• Can result from eating improperly _______________ food
• Symptoms are neurologic:
  • Blurring of vision
  • Weakness
  • Difficulty in speaking and breathing

71 □ CARE FOR FOOD POISONING
• Try to obtain as much _______________ as possible.
• Transport patient to hospital promptly.
• If more than one person experiences symptoms, suspect food poisoning.
• If possible, bring some of the suspected food to the hospital.

72 □ PLANT POISONING
• Many household plants are poisonous if ingested.
• Several thousand cases of plant poisonings occur each year.

73 □ DIEFFENBACHIA
• Irritation of the skin and/or _______________ membranes
• Maintain an open airway.
• Give oxygen.
• Transport the patient promptly to the hospital for respiratory support.

74 □ MANAGEMENT OF PLANT POISONINGS
Assess the patient’s airway and vital signs:
• Notify poison control center.
• Take the plant to the emergency department.
• Provide prompt transport.