Chapter 30

Weapons of Mass Destruction and the EMT

Learning Objectives

- Describe role of EMT at nuclear, biologic, chemical (NBC) event
- Describe threat of nuclear, biologic, chemical (NBC) incident by terrorists
- Distinguish hazardous materials incident from NBC terrorist event
- Recognize how NBC weapon may be spread/disseminated

Learning Objectives

- Recognize signs/symptoms NBC agents
- Describe importance of surveillance in recognizing NBC event
- Describe six biologic warfare agents, recognize signs symptoms of exposure
- Describe how manage care for victims biologic agent
Learning Objectives

- List agents that risk secondary transmission, action to protect against spread, person protective equipment, isolation measure
- List four types chemical agents may be used in terrorist attack
- List two agents causing immediate symptoms that may require antidote treatment at scene
- Describe principles decontamination vapor exposure

Learning Objectives

- Describe principles of decontamination liquid exposure
- Describe types of radiologic hazards
- Describe difference between radioactive particles, radioactive waves
- Describe difference between contamination, irradiation, incorporation

Learning Objectives

- Describe acute radiation syndrome
- List factors that affect severity of radiation exposure, how to limit exposure
Terrorism Preparedness Response

- Goal of terrorist
  - Kill or maim
  - Population feel unsafe
  - Destabilize society
  - Spread fear, panic

Preparing for terrorist events

- Counterterrorism policy
- Metropolitan medical response system
- Preparation for all disaster must begin at home

Training for response to terrorist events

- Incidents may involve explosive, incendiary, nuclear, biologic, or chemical agents
- Knowledge of NBC agents complements EMS training
- First responders trained to recognize & respond to NBC
- Be ready to include agents of mass destruction in scene size-up
Terrorist WMD Events

- WMD
  - Include NBC agents
- Distinguish NBC terrorist incident from hazmat incident
- Preserve potential evidence

Overview—Nuclear, Biologic, Chemical Agents

- Nuclear agents
  - Nuclear threats exist
  - Know
    - Victim contaminated or irradiated
    - Concepts of distance, time, and shielding are used to reduce risk

Overview—Nuclear, Biologic, Chemical Agents

- Biologic agents
  - Incubation period
  - Most not contagious
  - Smallpox, plague can be spread
  - Creates fear, panic
Overview—Nuclear, Biologic, Chemical Agents

- Chemical agents
  - Cause immediate havoc & destruction
    - Public instantly aware and defensive measures can begin immediately
  - Nerve & cyanide gas can cause death in minutes
  - Blistering agents cause early as well as delayed effects, which build intensity
  - Other agents may not cause symptoms until hours after exposure

Dissemination Devices

- Must be matched to properties of NBC agent
- Agents might be contained in elements that release agent when broken
- Spraying devices are effective means to spread chemical and biologic agents
- Moving vehicle or plane & aerosol can contaminate downwind of release

Dissemination Devices

- Vectors
  - Letters and packages
  - Insects and animals
  - Clothing
  - Food
  - Water
Dissemination Devices

- Chemical agents dangerous in vapor or gas & liquid forms
- Exploding devices cause traumatic injuries & NBC agent injury

Suspecting Nuclear, Biologic, Chemical Event

- Likely targets
  - Large public gathering places
- Signs at event
  - Multiple casualties previously well
    - Same complaints
    - Similar onset
  - Index cases
    - Victims with severe effects
    - Early fatalities
  - Syndrome surveillance

Public Health EMS

- Public health
  - Constantly monitors outbreaks
- EMS
  - First responder to health events
  - May be called to the scene of an announced exposure, but are more likely to encounter victims after event
  - Calls to EMS may be one of the first signs in a community that a biologic outbreak has occurred
Biologic Agents

- Biologic agents
  - Include:
    - Bacteria
    - Viruses
    - Fungi

- Deliberately spread
- Kill or immobilize large numbers
- CDC category
- Invades body, multiplies, and causes illness
- Not all contagious
- Understand basic control principles
- EMT must follow rules of infection control
Biologic Agents

- Biologic agent in warfare, terrorism
  - 6th century BC
    - Assyrians
    - French & Indian War
  - WWI, II
    - Japanese dropped plague-infected fleas over China & Manchuria
  - After WWII
    - Countries greatly increased production of biologic agents

Biologic Agents

- Spread biologic agents
  - Spores downwind, or food and water contaminated
  - Aerosolized dissemination vehicle
  - Garden spray canister

Biologic Agents

- Spread biologic agents
  - Crop duster, airplanes, moving vehicles with mounted sprayers
  - Wind & weather conditions affect distribution
    - Difference between indoor and outdoor distribution
  - Vector spread
Biologic Agents

- Detecting biologic event
  - Weapons may not be suspected until hours or days after release
  - Victims who travel from site - spread to others
  - Maintain high index suspicion

Biologic Agents

- Detecting biologic event
  - Clues
    - Large number victims, similar illness
    - High mortality rate
    - Illness unusual for area or out of season
  - Discover cause ASAP

Biologic Agents

- Smallpox
  - World Health Organization (WHO) declared eradicated 1980
  - Last recorded outbreak - 1977
  - World’s population no longer immunized
  - Threat epidemic serious concern
Biologic Agents

- Smallpox
  - Clinical illness
    - Variola virus causes smallpox
    - Incubation period - 12 days
    - Sudden onset
    - 2 to 3 days later
    - Lesions initially appear round and flat
    - Different than lesions in chickenpox, lesions are all in same stage of development

Biologic Agents

- Smallpox
  - Transmission personal protection precautions
    - Infectious from time rash appears until all scabs separate
    - Coughing, sneezing - source of spread
    - Contact precautions warranted
Biologic Agents

- Smallpox
  - Transmission personal protection precautions
    - Patient isolated from others
    - Mask placed over patient’s mouth during patient movement
    - Quarantine

Biologic Agents

- Smallpox
  - Treatment postexposure considerations
    - Vaccine available from CDC
    - Younger population - no immunity

Biologic Agents

- Smallpox
  - Prehospital considerations
    - Detect smallpox ASAP
    - Suspect you have been exposed
    - After transport smallpox victim – properly disinfect ambulance
Biologic Agents

- Plague
  - Major bioterrorist threat causing widespread transmission & high number deaths
  - Naturally found in rodents & prairie dogs

- Plague
  - Bubonic form transmitted by fleas
    - Raised tender lymph nodes, buboes

- Plague
  - Pneumonic plague
    - Can be spread by:
      - Aerosolized distribution of bacteria
      - Droplets to other persons
    - Carries almost 100% fatality rate if untreated
Biologic Agents

- Plague
  - Clinical illness
    - Incubation period 2 to 4 days
    - Acute onset
    - Respiratory failure - death can ensue
    - Bubonic plague

Biologic Agents

- Plague
  - Transmission personal protection precautions
    - Coughing spreads pneumonic plague
    - Rodent & flea interventions may be needed

Biologic Agents

- Plague
  - Treatment postexposure considerations
    - Administer antibiotics early
    - For prophylaxis, doxycycline is used
Biologic Agents

- Plague
  - Prehospital considerations
    - Key consideration - high index suspicion
    - Look for clusters of sudden & severe onset of respiratory illness
    - Use droplet transmission precautions
    - Postexposure follow-up is essential
    - Follow standard disinfection procedures

Biologic Agents

- Viral hemorrhagic fevers
  - Group of related illnesses
  - Animals or insects carry viruses
  - Respiratory transmission by aerosol dissemination
  - Different viruses cause viral hemorrhagic fever

Biologic Agents

- Viral hemorrhagic fevers
  - Clinical Illness
    - Symptoms
      - Fever
      - Muscle aches
      - Weakness
      - Flushing, small capillary hemorrhages on skin
      - Bleeding mucous membranes
      - Multiple-organ involvement, failure
Biologic Agents

- Viral hemorrhagic fevers
  - Transmission personal protection precautions
    - Contact transmission precautions are necessary
    - Respiratory precautions
    - If exposed, wash skin surface immediately
    - Mucous membranes should be irrigated with large amounts water or saline solution

Biologic Agents

- Viral hemorrhagic fevers
  - Treatment
    - Largely supportive
    - Vaccines available, antiviral agents helpful

Biologic Agents

- Viral hemorrhagic fevers
  - Prehospital considerations
    - Standard precautions
    - Careful attention to prevent contact transmission
    - When bleeding, copious secretions, vomiting & diarrhea are present
      - Protective gowns
      - Face shields
      - Surgical masks
      - Eye protection
      - High-efficiency particulate air (HEPA) filter
Biologic Agents

- Anthrax
  - Caused by bacterium bacillus anthracis
  - Forms spores when host dies
  - Spore form of bacteria is resistant
  - Typically occurs in animals
  - Spore invades body through inhalation or break in skin

Biologic Agents

- Anthrax
  - Three forms
    - Inhalational
    - Cutaneous
    - Gastrointestinal

Biologic Agents

- Anthrax
  - Image of infected skin
Biologic Agents

- Anthrax
  - Clinical illness
    - Inhalational occurs when spores inhaled deep into alveoli
    - Invades lymph nodes
    - Causes chest pain, shortness breath, flu-like symptoms
    - Fast growing, makes toxins, accumulate in lungs, around brain
    - Treated early, doxycycline, chance recovery good
    - Treated late, fatal
    - 2- to 6-day incubation period

Biologic Agents

- Anthrax
  - Transmission personal protection precautions
    - Standard precautions
    - Equipment contact body fluids, undergo standard disinfection practices

Biologic Agents

- Anthrax
  - Treatment postexposure considerations
    - Early treatment important
    - Common antibiotics effective
    - Vaccine available, high risk exposure
    - Spores, prophylactic treatment with antibiotic
    - If suspicious powder evident
      - Take off clothing, surgical mask
      - Shower, soap water
      - Clothing washed in laundry
Biologic Agents

- Anthrax
  - Prehospital considerations
    - Exposure to powder suspicious for anthrax
    - Does not result in sudden illness
    - No emergency patient care needed
    - Transportation not warranted of patients who do not have symptoms
    - Public health authorities should be informed of
      - Any exposed individuals
      - How to contact patient if follow-up becomes necessary

- Tularemia
  - Acquired through bites of
    - Deerflies
    - Mosquitoes
    - Ticks
    - Or contact with blood or tissue fluids of infected animals
    - Known to hunters as “deerfly fever” or “rabbit fever”
  - Caused by bacterium francisella tularensis
  - Infectivity rate of 90% to 100%, most people in a bioterrorist attack will become ill

- Tularemia
  - Clinical illness
    - Inhaled form results in sudden onset fever, chills, aches, fatigue, headache, loss body fluids 3 days after exposure
    - Follows bite, ulcer forms at site, lymph glands proximal to bite tender, swollen
    - Fever, malaise
    - Untreated, 30% mortality rate
Biologic Agents

Tularemia

- Transmission personal protection precautions
  - Possible to become infected by
    - Aerosol
    - Insect or tick bites
    - Contact with body fluids of infected animals
    - Contaminated food or water
    - Vector spread

Tularemia

- Treatment postexposure considerations
  - Antibiotics
  - Doxycycline
  - Vaccine under investigational study
Biologic Agents

- Tularemia
  - Prehospital considerations
    - Personal protection precautions
    - Droplet transmission precautions

Biologic Agents

- Botulism
  - Paralysis from head downward
  - Caused by toxin produced by Clostridium botulinum
  - Toxin produced by bacterium
  - Effects manifest within 24 hours
  - 60% mortality rate if untreated
  - Hazardous if inhaled

Biologic Agents

- Botulism
  - Clinical illness
    - Head-downward, descending paralysis
    - Death asphyxia result
    - Flaccid, no muscle tone
Biologic Agents

• Botulism
  ➢ Transmission personal protection precautions
    • Standard personal precautions

Biologic Agents

• Botulism
  ➢ Treatment postexposure considerations
    • Maintain airway
    • Support ventilation
    • Antitoxin
    • Intubation
    • Ventilator
Biologic Agents

- Botulism
  - Prehospital considerations
    * Supporting respirations

Biologic Agents

- Summary biologic agents
  - Likely suspected days after release
  - Stay alert to signs & symptoms
  - Decontamination - not significant issue
  - Agent is not on patient, but in patient
  - Always protect your health
  - Follow principles of infection control
  - In large outbreak, press all health workers into service
  - Preplanning essential
  - Adhere basic principles of infectious disease

Chemical Agents

- Nerve agents
  - Dissemination
    * Act by disrupting normal transmission of nerve impulses to muscles, organs, and glands
    * Results in excess secretions & paralysis
    * Liquid at room temperature
    * Can be dispersed by missiles, sprayers, and other devices
    * Liquid nerve agent can be absorbed through the skin
    * Vapor can be inhaled and also absorbed through the eye or skin
Chemical Agents

- Nerve agents
  - Toxicity
  - Act at nerve terminals that release acetylcholine
  - Acetylcholinesterase
  - Limits amount of free acetylcholine at nerve junction

- Clinical effects
  - Outpouring of secretions from every organ & orifice
  - Effects on involuntary muscles
  - Over stimulation of skeletal muscle
  - Eventual paralysis
  - Death results from paralysis of respiratory muscles & secretions in lungs
  - CNS effects follow large exposures

- Clinical signs guide field treatment with appropriate antidote

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Chemical Agents

- Nerve agents
  - Clinical effects
    - Salivation, lacrimation, urination, diarrhea, gastrointestinal cramps, emesis, miosis, muscular twitching (SLUDGEM)
    - Route entry dictate which symptoms appear first & time to severe toxicity
    - Liquid on skin will also first cause local effects
    - Clinical signs guide field treatment with appropriate antidote

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Chemical Agents

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Chemical Agents

- Nerve agents
  - Prehospital considerations
    - Eliminate continued exposure, stop absorption
    - Vapors
      - Move victim to fresh air
    - Remove outer clothing
    - Be aware entering closed spaces

- Nerve agents
  - Prehospital consideration
    - Liquids
      - Remove clothing
      - Remove blisters & blot visible agent
      - Scrape off with a tongue blade or flat instrument
      - Blot liquid with absorbent material
      - Flush with large amounts water
      - Decontamination on skin
      - Flush eyes with water - 15 min
      - Use protective clothing

- Nerve agents
  - Advanced aid
    - Advanced treatment for nerve agents includes
      - Antidotes
      - Prepackaged autoinjectors, time is crucial
      - Recommended dose is based on clinical presentation
      - MARK I kits or Duodote
      - Atropine
      - Pralidoxime
Chemical Agents

- Cyanide agents
  - Effective fast killer
  - Found in nature & industry
  - Lethal if ingested

Chemical Agents

- Cyanide agents
  - Dissemination
    - Liquid form munitions
    - Vaporize rapidly on detonation
    - Could disperse rapidly in open space
    - Closed space could represent continuing threat
Chemical Agents

● Cyanide agents
  ➢ Toxicity
    • Works rapidly, respiratory death at cellular level
    • Poisons cell’s ability use oxygen
    • Attaches to cell, cell unable use oxygen
    • Oxygen taken into blood, delivered, returns unused in venous blood

Chemical Agents

● Cyanide agents
  ➢ Clinical effects
    • Brain, heart, affected first
    • Short breath; increased pulse, blood pressure; unconscious, seizure, stops breathing
    • Effect dose
    • Distinguishing cyanide, nerve agent poisoning
    • Cyanogens chloride

Chemical Agents

● Cyanide agents
  ➢ Prehospital considerations
    • First priority, protect yourself, proper protective clothing
    • Remove victim to fresh air
    • Supportive therapy
    • Remove wet clothing, wash skin
Chemical Agents

- Cyanide agents
  - Advanced aid
    - Amyl nitrite, crushed inhaled
    - Sodium thiosulfate, injected in vein, promotes formation of thiocyanate, excreted in urine
    - Adult dose cannot be given to children
    - Hydroxycobalamin, does not alter hemoglobin
    - Care given in decision to use cyanide antidote

- Sulfur mustard
  - Belongs to vesicants or "blister agents"
  - Incapacitating rather than lethal
  - Affect skin, eyes, organs

Chemical Agents

- Sulfur mustard
  - Dissemination
    - Vapor, liquid threat to exposed skin, mucous membranes
    - Room temperature, evaporates slowly
    - Temp. 100°F, vapor hazard
    - Freezes below 57°F

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Chemical Agents

- Sulfur mustard
  - Toxicity
    * Cause chemical changes within body, lead to cell death, inflammatory reaction
    * Absorbed quickly through skin
    * Clinical effects not immediate
    * Symptoms and signs noticed hours after exposure

Chemical Agents

- Sulfur mustard
  - Clinical effects
    * Skin, eye, airway common effects
    * First sign, skin appears red, blisters form, outer skin separates from dermis
    * Dark-brown-black skin peels off, intact skin underneath
    * Mustard so reactive with body, chemical contamination risk

Chemical Agents
Chemical Agents

- Sulfur mustard
  - Clinical effects
    - Eyes sensitive to vapors
    - Photophobia, conjunctivitis, involuntary spasmodic winking, lid inflammation, swelling, brown discoloration

- Prehospital considerations
  - Immediate decontamination
  - Mustard penetrates through skin 2 min
  - Physical removal, dry decontamination kits, flushing water and soap water
  - Bleach solutions
  - Care supportive
  - No specific antidotes
  - Severe pulmonary signs require prioritization at triage, others delayed

Chemical Agents

- Pulmonary agents
  - Chlorine is more irritating
  - Phosgene
  - Nitrogen oxides
  - Ammonia
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**Chemical Agents**

- **Pulmonary agents**
  - **Dissemination**
    - Represents hazard
    - Concentration of pulmonary gases & physical properties affect
    - Signs of exposure
    - Timing of symptoms
    - Ammonia is a very soluble agent
    - Phosgene, less soluble - effects breathing

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**Chemical Agents**

- **Pulmonary agents**
  - **Toxicity**
    - Phosgene vapor is toxic if inhaled - liquid form has no threat
    - More soluble agents react with eyes & upper airway

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**Chemical Agents**

- **Pulmonary agents**
  - **Clinical effects**
    - Suspected signs & symptoms
    - Lung irritation
    - Pulmonary edema
    - When lungs fill with fluid
      - Shortness of breath
      - Persistent cough develops
      - Frothy sputum
      - Oxygen exchange is impaired, becomes hypoxic
Chemical Agents

- Pulmonary agents
  - Prehospital considerations
    - Direct victim to fresh air
    - Should not exert unless fleeing from toxic vapors
    - No specific antidotes
    - Care supportive
    - Supplemental oxygen
    - Positive-pressure ventilation
    - Intubated, if necessary
    - Secretions cleared with suction

Chemical Agents

- Summary chemical agents
  - Personal protection
    - Do not enter contaminated zones unless properly protected
    - Assume worst, maximal protection

Chemical Agents

- Summary chemical agents
  - Recognition
    - Early recognition reports
    - Cyanide
    - Mustard & some pulmonary agents have delayed effects
    - Mustard
    - Pulmonary
    - Hours may pass before shortness of breath noticed
    - Chemical detector paper & monitoring equipment may be brought to a scene
Chemical Agents

- Summary chemical agents
  - Decontamination
    - Vapors
      - Remove victim to clean air
    - Remove outer clothing
    - Liquids, solids
      - Physical removal, dilution washing, detoxification
      - Chemical agents removed immediately

- Physical removal
  - Scrape substance off outer clothing or skin
  - Remove liquid or solid contaminated clothing
  - Liquids, absorption powder or dry absorbing material
  - Flushing large amounts water

- Dilution, washing
  - Wash off agent with large amounts water and soap
  - Wounds contaminated should be irrigated with sterile saline solution or sterile water
Chemical Agents

- Summary chemical agents
  - Decontamination
    - Detoxification
      - Possible with bleach, soap, water
      - Dry decontamination kit
      - Half-time; time takes half agent rendered harmless
      - Detoxify, wash off chemical left on skin

- Decontamination
  - Medical care at scene
    - Focus on critical interventions
    - Decontamination major priority
    - Critical interventions; airway support, bleeding control, administration of antidotes nerve agent and cyanide victims
    - Common sense prevail

- Decontamination, triage, treatment
  - Care provided depend where victim encountered
  - Triage, abbreviated version START
  - Treatment MARK I administered through victim's clothing
  - Lifesaving treatment rendered in contaminated zones
  - Decontamination warm zone take place in separate areas for litter patients, ambulatory victims

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Chemical Agents

- Summary chemical agents
  - Decontamination
    - Victims salvaged receive priority
    - Care rendered documented triage tag
    - Enter contaminated zone, decontaminate before leaving
    - Hot, warm, cold zones may be unrealistic large-scale situations
    - Threat secondary contamination real

Nuclear Agents

- Nuclear radiation
  - Energy emitted from nucleus from an unstable atom
  - May be in the form of waves or particles
  - Has potential to alter molecules within cell & alter their function – "radiation injury"
  - Ionizing radiation can cause instant biochemical changes in the cell

Nuclear Agents

- Acute radiation syndrome
  - High doses of radiation sustained over short time
  - Can result in rapid onset of severe illness, death
  - Smaller doses
    - May result in genetic effects or increased risk of cancer or cataracts
    - May affect growth, development, life span
Nuclear Agents

- Radiation tolerance
  - Small amounts - not harmful
  - Exposed to radiation every day
  - Limits are set on the amount of radiation that we can be safely exposed to in the workplace
  - Not perceived by senses

Nuclear Agents

- Radiation incidents
  - Usually occur in workplace
  - Special precautions taken, plans made in advance for emergencies

Nuclear Agents

- Threat radiation terrorism
  - Department of Defense five scenarios
    - Deliberate spread radioactive material without explosion
    - Radiologic dispersal
    - Nuclear reactor sabotage
    - Improvised nuclear device
    - Nuclear weapon
  - Prepare for nuclear incidents
  - Understand basic principles regarding radiation hazards
Measuring Radioactive Activity

- Units measurements
  - Ionizing radiation can result in electronically measurable charge in air
  - Charge measured as roentgen (R)
  - Radiation absorbed dose (rad)
  - Roentgen equivalent man (rem)
  - Units expressed as 1/1000 parts or mR, mrad, mrem
  - 1000 mrem = 1 rem

Measuring Radioactive Activity

- Measuring instruments
  - Radioactivity must be measured with instruments
  - Two important instrument types
    - Survey
    - Personal monitoring device
  - Radiation survey should be performed at scene to guide rescue personnel
  - EMTs follow advice from radiation safety officers

Measuring Radioactive Activity

- Survey instruments
  - Measure rate exposure, calculate terms roentgens per hour/milliroentgens per hour
  - Dosimeters
    - Radiation-measuring instruments monitor total accumulation radiation
Types of Radiation

- Alpha radiation
  - Positive charged particle consisting of two protons and two neutrons
  - Least penetrating form, travels only a few centimeters
  - Can be stopped by a sheet of paper, clothing, and epidermis of the skin
  - Dangerous when
    - Ingested
    - Inhaled
    - Absorbed

Types of Radiation

- Beta radiation
  - Charged particles have the mass of an electron
  - Have either a negative or positive charge
  - In air - travels less than 1 foot to several feet
  - Travel deeper than alpha particles – stopped by skin

Types of Radiation

- Gamma rays
  - High-energy electromagnetic radiation rays
  - Penetrate body & cause damage by ionizing molecules in their path
  - Biochemical transformation of ionized molecules is instantaneous and may lead to biologic effects manifesting later
  - Gamma ray does not cause contamination of victim
  - Victim is of no risk to others, said to have been irradiated
Types of Radiation

- Neutrons
  - Uncharged particles found in nucleus atom
  - Occur in nuclear reactors
  - Much more penetrating than alpha and beta particles
  - Can cause considerable damage to underlying tissue
  - "Activate" body & materials in path

Contamination vs. Irradiation

- Irradiation
  - Radioactive energy in wave or ray form
  - Gamma rays pass through or penetrate body - do not remain as radioactive materials on or within
  - No risk to another
  - Only damage is a result of biochemical transformations resulting from ionization of molecules during penetration

- Contamination
  - Caused by radioactive particles physically present
  - Can spread to others
  - External contamination
  - Internal contamination
  - Incorporation
Contamination vs. Irradiation

- Types patients
  - Irradiated with no contamination
  - External contamination
  - Internal contamination by
    - Inhalation
    - Ingestion
    - Break in skin
  - Simple trauma

Acute Radiation Syndrome

- Damage
  - 50 rem, no visible effects
  - 100 rem, nausea, vomiting
  - 200 rem, nausea, vomiting, profound depression
    bone marrow
  - 400 rem, 50% die within weeks
  - 600 rem, 100% mortality, no medical intervention
  - 1000 rem, GI complications, nausea, vomiting,
    diarrhea immediate onset
  - 3000 rem, irreversible cardiovascular effects

Acute Radiation Syndrome

- Emergency medical care radiation victims
  - Main focus on emergency care
    - Treatment of associated injuries
  - Removal from further radiation exposure &
    decontamination
  - Contaminated victim
    - Requires attention to minimize internal contamination &
      incorporation
  - If internal contamination has occurred
    - Treatment to minimize chance of incorporation should be
      considered ASAP
Emergency Medical Care—Radiation Victims

- PPE, factors affecting severity exposure
  - Duration exposure
  - Distance from source
  - Shielding

Emergency Medical Care—Radiation Victims

- Emergency care radiation injuries
  - Know scope of care expected
  - Preplanning for radiation emergencies is done by industries that use radioactive material
  - Should receive appropriate specialized training in each aspect of expected performance

Actions for EMT as First Responder

- Create safety zone, make notification
- Use protection principles
- Use protective gear
**Actions for EMT as First Responder**
- Emergency medical care
- Decontamination
- Advance hospital notification, orderly transfer care

**Summary of Nuclear Agents**
- Understand basic principles of radiation injuries
- Protect self & others
- Identify substance, notify authorities, establish safety zone, use protective gear

**Summary of Nuclear Agents**
- Role of radiation safety officer crucial
- Irradiated patients present no hazard to EMT
- Contaminated patient
  - Handle carefully
  - Minimize internal contamination and secondary contamination
Summary of Nuclear Agents

- Emergency medical care at scene follows principles:
  - Remove victim from hot zone
  - Do not delay critical emergency medical intervention
  - Decontaminate patients

- Although most radiation incidents have not resulted in significant exposure to rescuers, EMTs must be aware of the potential danger

Summary of Nuclear Agents

- Early onset of symptoms & signs of acute radiation syndrome mean a high dose was absorbed

- Preplanning is key to effective management

Summary

- Terrorists have used biologic chemical WMDs in many countries

- EMT must be aware NBC threats to search recognize possible NBC scenarios

- EMT understands knowledge specific agents necessary to recognize, triage, treat, transport victims WMD agents
Summary

- NBC terrorist distinguished from hazardous materials incident by intentional nature, purposely hidden hazard, extremely toxic material, massive decontamination, secondary devices, crime scene

- NBC weapon disseminated by breaking/bursting agents, munitions, spraying devices, contamination ventilation systems, vectors

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Summary

- Signs NBC include multiple casualties who were well, all with same complaints, similar time onset, signs symptoms unusual for season, geographic area, particular age group, spread by vector unusual for region

- Surveillance EMS, ED patients for syndrome respiratory complaints, GI complaints, neurologic complaints/fever, rash caused by WMD agents, results in early investigation, early identification of NBC release

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Summary

- Early signs symptoms biologic agents, might be mistaken for flu

- Key management patients with illness caused by biologic agents, good infection control practice

- Biologic agents pose risk for secondary transmission; plague, smallpox, viral hemorrhagic fevers

- Chemical agents in bioterrorist attack; nerve agents, cyanide, pulmonary agents, sulfur mustard

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Summary

- Chemical agents immediate symptoms; nerve agents, cyanide
- Principles decontamination chemical agent vapor; move away from source, remove outer clothing
- Principles decontamination chemical agent liquid; physical removal, deactivation

Summary

- Types radiologic hazards; detonation nuclear weapons, nuclear reactor sabotage, explosive dispersal radiologic material, nonexplosive dispersal radiologic material
- Radiation exposure; irradiation, contamination
- Incorporation; physical binding radioactive material/particle within body’s tissues/organs

Summary

- Principles prehospital treatment radiologic casualties; self-protection, removal victims, provision basic life support emergency care, decontamination victim
- Self-protection principles; time exposure, distance, shielding
- Concerns contamination should not delay emergency care
- Radioactive particles are matter
Summary

- Acute radiation syndrome results from absorption of high doses of radiation over short time.
- Radioactivity detected by survey instruments.

Questions?