

RADIOLOGICAL & NUCLEAR THREATS

NULCEAR WEAPONS

- Objectives
- Identify indicators that may cause the EMS provider to suspect a radiological or nuclear incident
- Identify signs, symptoms and management of common radiological or nuclear injuries and illnesses
- Ensure adequate protection for EMS providers in a radiological or nuclear incident

NULCEAR WEAPON THREATS

- There are two different threats in the area of radiological/nuclear terrorism
- Dirty Bomb or Radiological Dispersion Device (RDD) – The use of common explosives to spread radioactive materials over a targets area.
- It does not cause a nuclear blast
- Nuclear Bomb or Improvised Nuclear Device (IND) – Any explosive device to cause a nuclear fission reaction, resulting in a nuclear blast.
- Nuclear fission is the splitting of an atom into two smaller atoms.

DIRTY BOMB / RADIOLOGICAL DISPERSION DEVICE

- Because an RDD uses ordinary explosives to spread radiological materials, the force of the blast and the amount of radioactivity is much lower and more localized than for an Improved Nuclear Device (IND).
- Low-level radioactive sources are commonly available and could be used in an RDD. They are found in hospitals, construction sites, and food irradiation plants.
 - Sources are used to diagnose and treat illnesses, sterilize equipment, inspect weld seams and irradiate food to kill harmful microbes
 - Blast will be immediately obvious
 - The presence of radiation will not be clearly defined without specialized equipment

NUCLEAR BOMB / IMPROVISED NUCLEAR DEVICE

- An IND causes a nuclear fission reaction, resulting in a nuclear blast. A nuclear blast is an explosion with intense light and heat, damaging pressure wave and widespread radioactive material that can contaminate the air, water and ground surfaces for miles around.
- Unlike RDDs that can be made with almost any radioactive material, INDs require highly enriched uranium or plutonium, which is difficult to obtain.
- An IND could consist of diverted nuclear weapon components, a modified nuclear weapon, or an indigenous-designed device.

NUCLEAR vs. CONVENTIONAL BLASTS

- A blast or explosion is a rapid release of a large amount of energy within a limited space.
- Nuclear blasts are far more destructive than conventional blasts:

POWER OF EXPLOSION

- Nuclear explosions can be millions of times more powerful than the largest conventional explosions

HEAT AND LIGHT

- Nuclear explosions create much higher temperatures and much brighter light flashes than conventional explosions.
- Burns and fire can occur at considerable distances
- A 10 kiloton nuclear blast can cause burns 2 miles away

RADIATION PRODUCED

- Most of the damage from a nuclear blast comes from the blast wave and the heat and light produced.
- The blast generates significant amounts of radiation.

TYPE OF RADIATION

- Three types of ionizing radiation:
 - Alpha
 - Beta
 - Gamma

ALPHA PARTICLES

- Heaviest and most highly charged of nuclear particles.
- Cannot travel more than a few inches

BETA PARTICLES

- Smaller and travel faster than alpha
- Cannot penetrate body tissue far enough to reach inner organs
- Layered clothing/protective garments provide adequate protection

GAMMA RAYS

- Gamma rays are a type of electromagnetic radiation transmitted through space in the form of waves
- Greatest penetration ability
- Can travel up to a mile

HEALTH EFFECTS OF RADIATION

- Except in extremely high doses, the onset of symptoms requires days to weeks.
- Typically no characteristic signatures.
- Time required for symptoms is dependent of the type and dose of radioactive material.
- Acute radiation sickness occurs when exposed to a large amount of radiation in a short period of time
- Exposure can increase the risk of cancer
- Symptoms include:
 - Skin irritation
 - Nausea
 - Vomiting
 - High fever
 - Hair loss
 - Skin burns

Radiation effects and thermal burns

Radiation burns
Petachiae
Alopecia

Full thickness burns

Complications caused by infection

Keloid scarring

Key safety factors for EMS personnel

- Approach/stand up wind
- **TIME**- Limit time personnel are exposed to the radiation source.
- **Distance**-Reduceing the proximity to the radiation source.
- **Shielding**- The use of materials to block radiation.

Epidemiology

- The onset of symptoms varies depending on the type and amount of radiation to which a victim is exposed. Low exposure is one to three hours; high exposure is 5-14 days. Radiation effects appear within hours after exposure.

NUCLEAR

- Terrorists and rogue nations around the world now have the capability to strike the United States with ballistic missiles carrying weapons of mass destruction. Regrettably, we are currently defenseless against such an attack.

RADIOLOGICAL / NUCLEAR CONTAMINATION

- Can contaminate food and water
- Consuming contaminated food or water can be harmful
- Land and buildings can become contaminated and rendered unusable for a long time

RADIOLOGICAL / NUCLEAR RESPONSE CONSIDERATIONS

- EMS Response
- Stay upwind
- Isolate / secure area
- Be alert for small secondary devices
- Use PPE
- Avoid any smoke or fumes
- Initiate self evacuation to designated area
- Treatment occurs following decontamination