General CBRNE Identification of Agents

Purpose: This is written to provide general pre-arrival information for suspected HAZMAT and CBRNE (chemical, biological, radiological, nuclear, and explosive) incidents.

NOTE: This information is an overview of different types of incidents and agents.

Signs of an Incident

1. A chemical or biological incident may not always be obvious.
2. Many of the early signs and symptoms produced by chemical agents may resemble those of a variety of disorders. Biological symptoms are generally delayed.
3. The patient's clinical presentation may offer clues about the type of toxic substance exposure.
    - A. **CHEMICAL INCIDENT**
        - i. Explosions or suspected release of liquids, vapors or gases
        - ii. Mass casualties without obvious trauma
        - iii. Similar presentation and/or symptoms for multiple patients.
    - B. **BIOLOGICAL INCIDENT**
        - i. An unusual increase in the number of individuals seeking care, especially with similar symptoms such as respiratory, neurological, gastrointestinal, or dermatological symptoms.
        - ii. Any clustering of patients in time or location (e.g., persons who attended the same public event).
    - C. **RADIOLOGICAL INCIDENT**
        - i. Notification of the detonation of a nuclear device.
        - ii. Dirty bomb
        - iii. Known issues with nuclear power plant or other radioactive source.
    - D. **NUCLEAR INCIDENT**
        - i. Explosion with mushroom cloud and devastation of a large geographical area
    - E. **EXPLOSIVE INCIDENT**
        - i. Responders should be aware of the possibility of secondary incendiary devices and agents.
        - ii. Obvious trauma.

Medical Response

4. First responding units must approach with caution.
5. Approach upwind, uphill and upstream, as appropriate.
6. Utilize resource materials such as the Emergency Response Guidebook, Emergency Care for Hazardous Materials Exposure, or smart phone applications.
7. Utilize appropriate PPE.
8. Be aware of contaminated terrain and contaminated objects.
9. Hazmat response protocols must be initiated, as well as unified incident command.
10. Maintain a safe distance from the exposure area.

11. Attempt to identify the nature of the exposure by looking for placards, mode of dispersal (vehicle explosion, bomb, aerosolized gas, etc.)
12. Victims and potential victims must be evacuated rapidly from the contaminated area and decontaminated as quickly as possible, if appropriate.
13. Treatment may be initiated within the hot and/or warm zones of an incident by properly trained, protected, and equipped personnel.
14. Be alert for secondary devices.

Select Agents

1. **Chemical Agents**
   A. Chemical agents are compounds that may produce damaging or lethal effects.
   B. The potential of the agent to do damage is measured by how readily it disperses. Wind and rain will increase the dispersion rate of a chemical agent.
      i. **Persistent agents** have low volatility, evaporate slowly and are particularly hazardous in liquid form. They stay around for long periods of time (24 hours or longer) and contaminate not only the air but objects and terrain as well. Mustard and the nerve agent VX are examples of persistent agents.
      ii. **Non-persistent agents** are volatile and evaporate quickly, within several hours. Gases, aerosols, and highly volatile liquids tend to disperse rapidly after release. Phosgene, cyanide and certain nerve agents (with the exception of GD-Soman) are non-persistent agents. Because of their volatility, they pose an immediate respiratory hazard but are not particularly hazardous in liquid form.
   C. Chemical agents are classified by their effects:
      i. **Nerve agents**, the most deadly of all chemical agents, disrupt nerve transmission within organs and are quickly fatal in cases of severe exposure.
      ii. **Blood agents** (cyanides) interfere with the blood's ability to transport oxygen throughout the body; often rapidly fatal.
      iii. **Blister agents,** or vesicants, cause a blistering of the skin and mucous membranes, especially the lungs.
      iv. **Choking agents,** or pulmonary agents, irritate the lungs, causing them to fill with fluid.
      v. **Incapacitating agents,** cause an intense (but temporary) irritation of eyes and respiratory tract.
2. **Biological Agents:** Micro-organisms and toxins, generally, of microbial, plant or animal origin to produce disease and/or death in humans, livestock and crops.
   A. Biological agents
      i. Bacterial Agents (e.g. Anthrax, Cholera, Plague, Tularemia, Q-Fever)
      ii. Viral Agents (e.g. Smallpox, Viral Hemorrhagic Fevers)
      iii. Biological Toxins (e.g. Botulinum Toxins, Staphylococcal Enterotoxin B, Ricin, Trichothecene Mycotoxins (T2))

*Biological agents utilized as a CBRNE may not become evident until hours, days, or weeks after the exposure due to the various incubation periods for each pathogen.

3. **Radiological Agents:** Exposure typically has no immediate effect. The sooner the victim has symptoms (example: nausea and vomiting) the more significant the exposure.
4. **Nuclear Agents:** Primary risk is massive trauma and devastation as the result of a large-scale blast.
5. **Explosives:** Threats with explosive devices may be or large or small scale.

Personal Protective Equipment

1. **NIOSH/OSHA/EPA classification system:**
   A. **Level A:** Fully encapsulating, chemical resistant suit, gloves and boots, and a pressure demand, self-contained breathing apparatus (SCBA) or a pressure-demand supplied air respirator (air hose) and escape SCBA. (Maximum protection against vapor and liquids)
   B. **Level B:** Non-encapsulating, splash-protective, chemical-resistant suit that provides Level A protection against liquids but is not airtight. (Full respiratory protection is required but danger to skin from vapor is less)
   C. **Level C:** Utilizes chemical resistant clothing along with a full-faced/half mask air purifying respirator or PAPR rather than an SCBA or air-line.
   D. **Level D:** Limited to coveralls or other work clothing, boots, and gloves
2. **Universal Precautions:**
   A. Assume that all patients are potentially contagious and use appropriate barriers to prevent the transmission of pathogenic organisms. PPE include gloves, gowns, HEPA respirators, face shields and appropriate handwashing.
   B. If a chemical exposure is suspected, appropriate protective suits and respirators (PAPR) with Organic Vapor/HEPA cartridges should be donned.