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 designed to augment other established protocols.

MFR/EMT/SPECIALIST/PARAMEDIC
First Responder/ EMS Issues

1. **Chemical agents** pose a threat during every phase of their existence: production, packaging, storage and delivery to the intended target. Many common hazardous materials used in industry pose the same threat to emergency responders as the chemicals classified as nerve, blister, blood, and choking agents.
2. **Biological threats** may be intentional or natural. Either may affect large segments of the population and will not necessarily present immediately.
3. **Radiological threats** affecting a significant portion of the population will most likely be associated with the explosion of a nuclear device or with the intentional release of radioactive material, including associated with an explosion as in a "dirty bomb".
4. **Nuclear threats** may be intentional or accidental. Either may affect large segments of the population. Immediate threat is results of explosion followed by devastation of radioactive isotopes.
5. **Explosive threats** may be intentional or accidental. Either may affect large segments of the population and will present immediately. Those not affected by initial device may risk threat from agents released. Awareness should be heightened for secondary incendiary devices in the event of an intentional explosive.

Signs and Symptoms of Attack

1. Unlike an attack with explosives, the fact that a terrorist has attacked with a chemical or biological agent may not always be obvious at first.
2. Many of the early signs and symptoms produced by chemical warfare agents may resemble those of a variety of disorders, including stress, psychological withdrawal, palpitations, gastrointestinal distress, headaches, dizziness, and inattentiveness.
3. The patient's clinical presentation will offer clues about the type of toxic substance used.
   A. **CHEMICAL INCIDENT** (HAZMAT or CBRNE)
      a. Responders should be alert for the following signs that a chemical agent may have been dispersed:
      b. Explosions that dispense liquids, vapors or gases
      c. Explosions that seem only to destroy a package or bomb device
      d. Unscheduled and unusual spray being disseminated
      e. Abandoned spray devices
      f. Numerous dead animals, fish and birds
      g. Lack of insect life
      h. Mass casualties without obvious trauma
      i. Definite pattern of casualties and common symptoms
      j. Civilian panic in potential target areas (government buildings, public assemblies, etc.)

k. Any clustering of symptoms or unusual age distribution (e.g., chemical exposure in children).

B. **BIOLOGICAL INCIDENT** (Natural or CBRNE)
   a. Responders should be alert for the following signs that a biological agent may have been dispersed:
   b. An unusual increase in the number of individuals seeking care, especially with similar symptoms such as respiratory, neurological, gastrointestinal or dermatological symptoms.
   c. Any clustering of patients in time or location (e.g., persons who attended the same public event).

C. **RADIOLOGICAL INCIDENT** (CBRNE)
   a. Notification of the detonation of a nuclear device.
   b. Dirty bomb

D. **NUCLEAR INCIDENT** (Natural or CBRNE)
   a. Explosion with mushroom cloud and devastation of a large geographical area (atypically large for an incendiary device)

E. **EXPLOSIVE INCIDENT** (Natural or CBRNE)
   a. Responders should be aware of the possibility of secondary incendiary devices and release of a threatening agent.
   b. Obvious trauma
   c. Panic in potential target areas.

MEDICAL RESPONSE

1. First responding units must approach with caution.
2. Approach upwind, uphill and upstream, as appropriate.
3. Utilize resource materials such as the Emergency Response Guidebook or Emergency Care for Hazardous Materials Exposure.
4. Utilize appropriate PPE.
5. Be aware of contaminated terrain and contaminated objects.
6. Hazmat response protocols must be initiated, as well as unified incident command.
7. Maintain a safe distance.
8. Attempt to identify the nature of the exposure by looking for placards, mode of dispersal (vehicle explosion, bomb, aerosolized gas, etc.)
9. Victims and potential victims must be evacuated rapidly from the contaminated area and decontaminated as quickly as possible, if appropriate. In certain situations, treatment may be initiated within the hot and/or warm zones of an incident by properly trained, protected and equipped personnel.
10. Be alert for secondary devices.

Select Agents of Terrorism

1. **Chemical Agents**
   A. A chemical agent may be defined as a compound that, through its chemical properties, produces lethal or damaging effects in humans, animals, plants or materials. Chemical agents are usually man-made through the use of industrial chemical processes.
      a. Chemical agents are classified by their effects:
   B. **Lethal agents** are designed to kill, and are broken down into two subcategories:

a. Nerve agents
   1. Nerve agents, the most deadly of all chemical agents, disrupt nerve transmission within organs and are quickly fatal in cases of severe exposure.

b. Blood agents
   1. Blood agents (cyanides) interfere with the blood's ability to transport oxygen throughout the body; often rapidly fatal.

C. **Blister agents,** or vesicants, cause a blistering of the skin and mucous membranes, especially the lungs.

D. **Choking agents,** or pulmonary agents, irritate the lungs, causing them to fill with fluid.

E. **Incapacitating agents,** cause an intense (but temporary) irritation of eyes and respiratory tract.

   a. The potential of the agent to do damage is measured by how readily it disperses. Chemical agents are either *persistent* or *non-persistent.* Wind and rain will increase the dispersion rate of a chemical agent. Heavy rains act to dilute both persistent and non-persistent agents and facilitate penetration into the ground.

F. **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.

G. **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 the G series of 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.

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

a. Bacterial Agents
   1. Anthrax
   2. Cholera
   3. Plague
   4. Tularemia
   5. Q-Fever

b. Viral Agents
   1. Smallpox
   2. Venezuelan Equine Encephalitis
   3. Viral Hemorrhagic Fevers

c. Biological Toxins
   1. Botulinum Toxins
   2. Staphylococcal Enterotoxin B
   3. Ricin
   4. Trichothecene Mycotoxins (T2)

B. 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:** Isotope exposure with typically no immediate effect. The sooner the victim has symptoms the worse the exposure.
4. **Nuclear Agents:** Primary risk is massive trauma and devastation as the result of a large scale blast. Supportive care and treatment based upon exposure.
5. **Explosives:** Threats with explosive devices may be or large or small scale. Trauma and mass casualty care will be primary.

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 a splash suit along with a full-faced positive or negative pressure respirator (a filter type 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, coated Tyvex suits, and respirators with Organic Vapor/HEPA cartridges are recommended.