

**STATE OF OHIO**  
**EMERGENCY MEDICAL SERVICES**  
**WEAPONS OF MASS DESTRUCTION**  
**GUIDELINES AND PROCEDURES MANUAL**



**State of Ohio Emergency Medical Services Weapons of Mass  
Destruction Guidelines and Procedures Manual**

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**INTRODUCTION**

Ohio emergency medical services (EMS) professionals strive every day to deliver the highest standard of emergency medical services to the people of Ohio. On behalf of the State Board of Emergency Medical, Fire, and Transportation Services, the Regional Physician Advisory Board was charged with drafting proposed guidelines that EMS agencies could use in setting that standard.

Please note that the proposed guidelines are not mandatory for Ohio EMS agencies. The guidelines and procedures manual is meant to assist in the development of local protocols. It is the Board's hope that individual regions or agencies will review these guidelines with their medical directors and legal counsel when drafting their own individualized protocols. The guidelines were revised in 2012 during Ohio's transition to the National EMS Scope of Practice Model as the minimum foundation for the Ohio EMS scope of practice and to the National EMS Education Standards. This document will be periodically reviewed by the Regional Physician Advisory Board in order to maintain the most current information available.

**Reviewed & Approved by:**  
**Regional Physician Advisory Board Chairs**  
**Medical Oversight Committee**  
**State EMFTS Board**

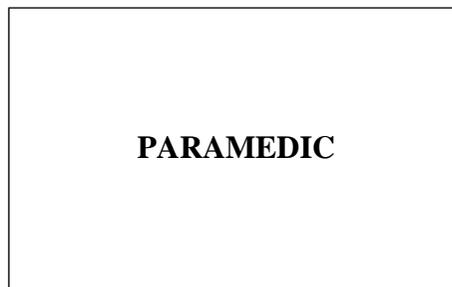
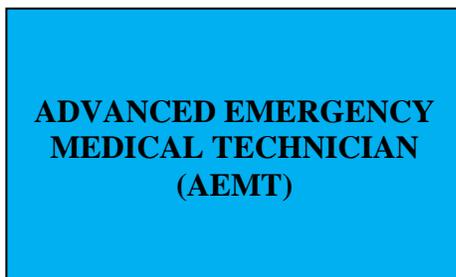
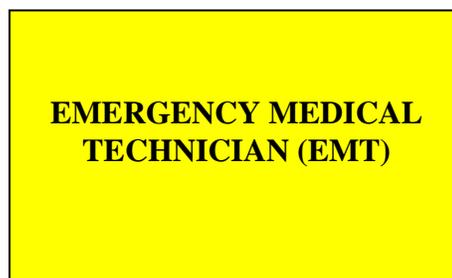
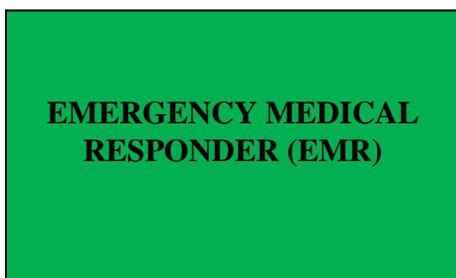
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## GENERAL PRINCIPLES

All algorithms are color coded to denote procedures that may be performed by each level of certification. To perform procedure color coded red, medical control must be contacted for permission.

Higher levels of certification will perform lower level evaluations and procedures when interpreting the algorithms.

## KEY TO ALGORITHMS



## GENERAL PRINCIPLES

An event involving Weapons of Mass Destruction (WMD) or Nuclear, Biological, or Chemical (NBC) weapons is by definition a mass casualty incident (MCI). These guidelines are to be used in conjunction with disaster protocols on a local and state level. These guidelines will be operated under the Incident Command system, with the fire service acting as line authority and having command of the scene. These guidelines are not inclusive of all WMD or NBC agents that exist, and are not intended to replace the resources and information available from the Emergency Management Agency, Department of Health, Department of Homeland Security, and HazMat agencies. These guidelines focus on those agents that are listed as Category A agents by the Center for Disease Control (CDC) and agents that are most likely to cause higher morbidity and mortality, widespread public exposure, or create a scene where public health resources may be overwhelmed.

The first priority will be rescuer safety. No rescuer, fire, EMS, law enforcement or otherwise will proceed into the “hot zone” (a zone where decontamination has not taken place) without proper equipment and protection, and without the expressed consent of the Incident Commander. This is for the safety of the rescuer, and to prevent the rescuer from becoming a victim, compounding the problem. EMS will operate in the “cold zone” (an area designated for patient care that takes place after sufficient decontamination) and will not approach the hot zone due to possible respiratory or chemical contamination. Caregivers should have their nerve agent antidote auto-injectors available or distributed upon initiating treatment to patients of known NBC exposure. It must also be remembered that the most commonly used weapons are explosives and secondary explosives have been used to injure or kill EMS professionals in the past. Therefore, staging EMS in the “cold zone” will help prevent secondary provider injury.

Immediately upon arrival of EMS to the scene of an incident involving large numbers of victims with presumed exposure to NBC agents, the EMS service will have their dispatch contact the Ohio State Highway Patrol or the state Emergency Management Agency and advise them of the current situation and radio frequency that they will use to contact the Medical Command and Incident Command.

### **NBC Agents**

It must be realized that chemical agents have immediate effects, whereas biological agents and radiation agents are delayed and will allow for consultation with higher authorities. Chemical agents and explosive agents however, require immediate action, and thus the protocol is aimed at these agents.

#### *Biologic Agents*

These may range from smallpox virus to anthrax. In general, it may take several hours for a team to determine what the agent is. Therefore, prophylactic treatment is only advised with consultation of the medical director, who in turn will consult with federal authorities and the Department of Public Health.

### *Blister Agents*

Blister agents, such as mustard gas, have signs and symptoms that include red skin, blisters, dry cough, and hoarse voice.

### *Blood Agents*

Cyanide is the most common blood agent. Signs and symptoms range from death, coma, and seizures, to headache, chest pain, palpitations, and shortness of breath in mild exposures.

### *Choking Agents*

Choking agents, such as chlorine, ammonia, methylisocyanate, have signs and symptoms that include cough, choking, gagging, tearing and secretions.

### *Explosive Agents*

Explosions in enclosed spaces cause trauma by direct and indirect means. The force of an explosion may cause trauma, the victim may fall and sustain injury, or debris may impact victims. In addition, air-filled structures like bowel, tympanic membranes, and lungs are particularly susceptible to a sudden change in air pressure.

### *Nerve Agents*

Nerve agents, such organophosphates, Sarin, VX, etc have a range of toxicity from death, paralysis, seizures, and coma, to headache, nausea and vomiting, defecation, salivation, bronchial constriction, and visual disturbances. A mnemonic used to remember the most common signs and symptoms is SLUDGEM. SLUDGEM stands for Salivation, Lacrimation (tearing), Urination, Defecation, Gastrointestinal upset, Emesis, and Muscle twitching/Miosis (pupillary constriction). Another mnemonic is DEM BLUES. DEM BLUES stands for Diaphoresis, Emesis, Miosis, Bradycardia, Lacrimation, Urination, Expiratory wheezing, and Salivation.

### *Nuclear Agents*

“Dirty bombs” use radioactive material to contaminate a wide-spread area. Typically their effects are not immediate, although burns may occur to individuals in close proximity to the explosion. Tissues that have rapid cell growth, such as the gut and the skin, are usually the first effected.

## **CLINICAL TREATMENT GUIDELINES FOR WMD AGENTS**

**(Based on the Atlanta Olympic Protocols, U.S. Army Protocols, and Maryland Emergency Medicine System Protocols)**

**USE THE START TRIAGE PROTOCOL. Patients who are in arrest due to WMD agents will not be resuscitated. Aggressive airway management is necessary, and early antidote administration is imperative.**

**UNIVERSAL PRECAUTIONS should be practiced during the treatment of all patients within the scene of known or potential contamination. Personal protective equipment to be worn includes gloves, gowns, respirator masks, and shoe covers. Additional measures to be taken are noted within the guidelines.**

**PATIENT DECONTAMINATION should include removal of the patient from the site and removal and containment of any and all contaminated or potentially contaminated clothing or released body fluids. Additional measures to be taken beyond these minimum standards are noted within the guidelines. Decontamination of all equipment, including the transport vehicle, must be considered and, if necessary, performed following patient transport.**

**EMS CHEMPACK DEPLOYMENT PROTOCOL should be activated when there is a confirmed or potential release of a chemical or biologic agent, an explosion of unknown source, a potential for a large number of victims, incidents in which a large number of victims present with signs and symptoms for which the CHEMPACK assets may be therapeutic, or when the anticipated need for nerve agent antidotes exceed the resources of the EMS system. These include signs and symptoms for which the responder may feel that self-administration of the contents of nerve agent antidote auto-injectors may be potentially necessary.**

**FOR ALL AREAS WHERE ALBUTEROL ADMINISTRATION IS INDICATED, please note that wheezing is a less reliable indicator of bronchospasm in infants and children due to the anatomical configuration of their airways. Severe smaller airway constriction with resultant hypoxia may be present. All infants or children in apparent distress should be immediately assessed with pulse oximetry. If bronchospasm is present, treat as asthma with inhaled albuterol. Brochospasm may be particularly severe, especially in previously sensitized individuals and must be treated aggressively.**

## **BIOLOGICAL AGENTS**

### **Anthrax**

1. **General:** Anthrax is a highly lethal infection spread by inhalation of the spore form of the bacteria *Bacillus anthracis* or its entry through an opening in the skin causing a localized infection. Inhalation anthrax is rapidly infectious and highly lethal.
2. **Health Effects:** The incubation period for both routes is 1-6 days. The initial symptoms of inhalation anthrax are nonspecific, but may include malaise, fever, headache, and occasionally, substernal chest pain. Fever, malaise, fatigue, cough, and mild chest discomfort are followed by severe respiratory distress with dyspnea, diaphoresis, stridor, and cyanosis. Shock and death occur within 24-36 hours of severe symptoms. In cutaneous anthrax, a papule develops, then vesicles, followed by a black eschar surrounded by moderate to severe edema. The lesions are usually not painful. Without treatment, the disease may progress to septic shock and death, with a case-fatality rate of 20%. With treatment, fatalities are rare.
3. **Patient Decontamination/Evaluation:** Secretion and lesion precautions should be practiced. Anthrax has not been transmitted by the aerosol route person-to-person.
4. **Prehospital Patient Treatment:**
  - a. Evaluate the patient for fever, cyanosis, and respiratory distress.
  - b. The patient should be given oxygen and evaluation of oxygen saturation via pulse oximeter during transport, as needed.
  - c. Obtain IV access with lactated Ringer's or normal saline at KVO rate.
  - d. Apply a cardiac monitor.
  - e. Antibiotic therapy will be given at the hospital.
  - f. Transport the patient to the most appropriate medical facility as directed by medical consultation. The Department of Public Health or the CDC may want these patients isolated at one facility.

**NOTE: Prophylaxis:** Public health officials may recommend that others who may have been initially exposed take prophylactic antibiotics and immunizations before they show signs of illness. If a registry is established, all emergency personnel should identify themselves and indicate when, where, and to what extent they might have been exposed. Consult your medical director as to whether or not you should start prophylactic antibiotics. The adult dose is Cipro 500 mg every 8-12 hours. The pediatric dose is 10-15 mg/kg every 12 hours with a maximum single dose of 500 mg. Oral ciprofloxacin (500 mg every 12 hours) or doxycycline (100 mg every 12 hours) should be given to adults with known or imminent exposure. The pediatric dose is 10-15 mg/kg every 12 hours up to a single dose of 500 mg. Doxycycline is contraindicated in children less than 8 years old and pregnant women. In children 8 years and older, the dose for children weighing less than 45 kg is 2.2 mg/kg every 12 hours and for those weighing more than 45 kg, the dose is 100 mg every 12 hours. Amoxicillin 500mg every 8 hours should be administered to pregnant or lactating women.

There is a licensed vaccine for use in those considered to be at risk of exposure. The vaccine is administered at 0, 2, and 4 weeks for the initial series, followed by boosters at 6, 12, and 18 months and then an annual booster. After confirmed exposure, all unimmunized individuals should have two 0.5 ml doses of the vaccine 2 weeks apart, and those vaccinated with less than three doses prior to exposure should have a single 0.5 ml booster. Anyone vaccinated with the initial three-dose series in the previous 6 months does not need a booster. Everyone exposed should continue antibiotics for 4 weeks. If no vaccine is available, antibiotics should be used beyond 4 weeks and withdrawn under medical supervision. The dose for the vaccine has not been established for patients under the age of 18.

***ROUTINE VACCINATION IS NOT CURRENTLY IN THE EMS SCOPE OF PRACTICE. However, in cases of extreme emergency, upon the authorization of the Director of the Ohio Department of Health, EMS professionals may be called upon to give immunizations in order to cover a large population.***

## **Arenaviruses**

- 1. General:** The CDC has cited this class of virus as a high potential for use as a biologic weapon. Arenaviruses are unique because infected newborns will be asymptomatic due to their immature immune systems yet are contagious. There are several viruses in this class. However, the CDC has cited those that cause Lassa fever and Junin (or Argentine) fever as primary concern for biologic warfare.
- 2. Health Effects:** The average incubation period for Lassa fever and Junin fever is 1-2 weeks. Infected patients typically present with flu-like symptoms including fever, chills, vomiting, headache, and muscle aches. One of the hallmarks for Lassa fever, occurring in 70% of patients, is a severe purulent sore throat beginning within a week of the onset of symptoms. Swollen lymph nodes may be present, but they are not tender. Marked facial, neck, and eye swelling occurs in the later stages of Lassa fever. Patients with Junin fever may have purulent tonsils 3-5 days after the onset of fever, but they are painless and the lymph nodes are not swollen. In the later stages of infection, severe abdominal pain and vomiting, dyspnea, confusion, agitation, and internal and external bleeding occurs in both diseases. Despite hypotension from septic shock and dehydration, a relative bradycardia may be present.
- 3. Patient Decontamination/Evaluation:** Universal precautions and standard patient decontamination.
- 4. Prehospital Patient Treatment:**
  - a. Evaluate the patient for fever, respiratory symptoms, dehydration as evidenced by clinical assessment and blood pressure, and obvious bleeding.
  - b. Administer oxygen and monitor oxygen saturation with a pulse oximeter.
  - c. Initiate an IV of normal saline or lactated Ringer's and administer fluid boluses if the patient is hypotensive.
  - d. Apply a cardiac monitor.

- e. The underlying cause of the patient's hypotension is hypovolemic and septic shock. The relative bradycardia is rarely cardiac in origin. In addition to the IV fluid boluses, an infusion of dopamine, if available, should be considered rather than administration of atropine.
- f. The primary treatment is supportive although there has been some success with ribavirin, an antiviral agent.

## Botulinum Toxins

1. **General:** Botulinum toxins are poisonous substances produced by a bacterium, *Clostridium botulinum*. They are usually formed in canned foods and subsequently ingested, but they also may be spread by aerosol and inhalation. The toxin blocks acetylcholine release at the neuromuscular junction and in the central and peripheral nervous systems. Biochemical warfare or terrorist attack should be suspected if numerous individuals develop progressive descending bulbar, muscular, and respiratory weakness.
2. **Health Effects:** The onset of symptoms may occur hours to days after exposure to the agent, so there is virtually no chance that emergency responders would be endangered by the poison carried by a victim. Symptoms typically include drooping eyelids, blurred or double vision, difficulty swallowing and speaking, dry mouth, and sore throat, followed by generalized weakness in the form of bilateral flaccid (limp) paralysis that begins near the head and moves downward. Death most often results from respiratory failure, so respiratory support is the most important aspect of prehospital care. Symptoms begin as early as 24-36 hours following exposure, but may develop several days after inhalation of the toxin.
3. **Patient Decontamination/Evaluation:** Hypochlorite and/or soap and water. Toxin is not dermally active and secondary aerosols are not a hazard from patients.
4. **Prehospital Patient Treatment:**
  - a. Evaluate the patient for paralysis, cyanosis, respiratory distress, and signs of pneumonia superimposed on paralysis.
  - b. All patients should receive oxygen and evaluation of oxygenation saturation via pulse oximeter.
  - c. The patient may require assisted respirations with a bag valve mask. Mechanical ventilation may be more important than administration of oxygen passively due to paralysis of respiratory muscles.
  - e. IV access should be obtained and normal saline at KVO infused.
  - f. Intubation and ventilatory assistance may be necessary for respiratory failure.
  - g. Apply a cardiac monitor.

Cricothyrotomy may be required.

  - h. Transport the patient to the most appropriate medical facility as directed by medical consultation.

**Hospital Treatment:** The administration of Botulinum antitoxin as soon as possible—trivalent licensed product made by CDC or heptavalent IND product--may prevent or decrease progression to respiratory failure and hasten recovery. Skin testing must be performed before administration of the antitoxin.

Prophylaxis: Pentavalent toxoid (types A, B, C, D, and E) is available as an IND product for those at high risk of exposure. The dosage schedule is 0, 2, and 12 weeks, with yearly boosters. The pediatric dose is the same as the adult dose.

## Filoviruses

1. **General:** In this class of viruses, the CDC has cited two viruses as having a high potential for being used as a biologic agent of terrorism. The Ebola virus and the Marburg virus are primarily transmitted via inhalation, but there have been reports of infections from contaminated needles. Both viruses cause hemorrhagic fevers.
2. **Health Effects:** The Ebola virus has an incubation period of 4-6 days with symptoms typically beginning on the fifth day of infection. The patient will develop sudden onset of fever, headache, diarrhea, abdominal pain, and muscle aches. If the respiratory tract is involved, the patient will have a severe sore throat, a cough, and pleuritic chest pain. A rash develops on days 5-7 of the infection and is followed by sloughing of the skin and massive internal and external bleeding. The Marburg virus has an incubation period of 3-9 days that is followed by fever, diarrhea, vomiting, headache, and muscle aches. The remainder of the course of the disease is similar to that of the Ebola virus.
3. **Patient Decontamination/Evaluation:** Universal precautions and standard patient decontamination.
4. **Prehospital Patient Treatment:**
  - a. Evaluate the patient for fever, evidence of dehydration by vital signs and clinical assessment, respiratory symptoms, and sources of obvious bleeding.
  - b. Administer oxygen en route as needed and monitor oxygen saturation via a pulse oximeter.
  - c. Initiate an IV of normal saline or lactated Ringer's and administer fluid boluses if the patient is hypotensive.
  - d. Apply a cardiac monitor.
  - e. The treatment of these viral infections is supportive as they are currently no anti-viral therapies approved for them.

## Plague

- 1. General:** Plague is an infectious disease caused by a bacterium called *Yersinia pestis* (formerly *Pasteurella pestis*). In nature, plague is most often spread by fleas that feed on infected rodents, and then bite humans. When spread by that route, it classically causes a local abscess with formation of very large, abscessed, regional lymph nodes called buboes (hence the term "bubonic plague"). Plague can also spread by aerosol and inhalation of sputum droplets from a coughing patient. In that manner, a primary pneumonic (pulmonary) form develops and progresses rapidly to death without treatment. The plague can also be spread from person to person.
- 2. Health Effects:** The incubation period for pneumonic plague is 2-3 days. High fever, chills, headache, hemoptysis, and toxemia progress rapidly to dyspnea, stridor, and cyanosis. Death results from respiratory failure, circulatory collapse, and uncontrollable internal and external bleeding. The incubation period for bubonic plague is 2-10 days. The symptoms are malaise, high fever, and tender lymph nodes (buboes). The infection may progress spontaneously to the nervous system (causing plague meningitis), lungs, and other organs causing septic shock.
- 3. Patient Decontamination/Evaluation:** Secretion and lesion precautions should be observed for patients with bubonic plague. Strict isolation of patients with pneumonic plague is needed. Early administration of antibiotics is very effective, but must be started within 24 hours of the onset of symptoms in pneumonic plague. Respiratory isolation with the use of a filtered respirator is necessary for those with direct contact with patients. Secretion precautions are necessary until the patient has been on antibiotics for at least 48 hours and there has been a favorable response to treatment. Chloramphenicol is necessary to treat plague meningitis. Heat, disinfectants, and exposure to sunlight render the bacteria harmless.

### 4. Prehospital Patient Treatment:

- Wear a properly fit-tested mask with a high-efficiency particulate (HEPA) filter, following the guidelines for control of tuberculosis.
- If breathing allows, the patient should be masked to stop as many of the cough droplets as possible before they evaporate to form small-diameter droplet nuclei, which are harder to filter out.
- Evaluate the patient for fever, cyanosis, and respiratory distress.
- The patient should be given oxygen during transport, as needed and evaluation of oxygenation saturation via pulse oximeter.
- Obtain IV access with lactated Ringer's or normal saline at KVO rate.
- All patients should receive cardiac monitoring when available.
- Transport the patient to the most appropriate medical facility as directed by medical consultation.
- Secretion and lesion precautions should be observed for patients with bubonic plague. Strict isolation of patients with pneumonic plague is needed. Respiratory isolation and secretion precautions are necessary until the patient has been on antibiotics for at least 48 hours and there has been a favorable response to treatment. Heat, disinfectants, and exposure to sunlight renders bacteria harmless.

- i. Wiping the ambulance interior with a 70% alcohol or other disinfectant must be done if there is gross contamination with secretions or pus; this is a reasonable precaution in all cases.

**NOTE: Prophylaxis:** Public health officials usually recommend that others who may have been exposed take prophylactic antibiotics before they show signs of illness. If a registry is established, all emergency personnel should identify themselves and indicate when, where, and to what extent they might have been exposed. Quarantine may be imposed on those who cannot take or who refuse to take prophylactic treatment. A licensed, killed vaccine is available. An initial dose is needed, followed by a second smaller dose 1-3 months later, and a third 3-6 months later. A booster dose is given at 6, 12, and 18 months and then every 1-2 years. This vaccine does not protect against aerosol exposure. After face-to-face contact with a pneumonic plague patient or after a confirmed or suspected attack with aerosolized plague, streptomycin 15mg/kg IM or doxycycline 100 mg twice a day for 7 days or for the duration of exposure, whichever is longer, should be used. Doxycycline is contraindicated in children less than 8 years old and pregnant women. In children 8 years and older, the dose for children weighing less than 45 kg is 2.2 mg/kg every 12 hours and for those weighing more than 45 kg, the dose is 100 mg every 12 hours. Children between the ages of 2 months and 8 years of age should receive Bactrim or Septra (4mg/kg of trimethoprim and 20mg/kg of sulfamethoxazole) twice a day. Newborns who may have sustained transplacental transmission of infection should be given gentamicin 2.5mg/kg every twelve hours. Pregnant women should be given a tablet of Bactrim DS or Septra DS twice a day.

## Q Fever

1. **General:** Q fever is an infectious disease caused by a rickettsial organism, *Coxiella burnetii*. The organism is robust and infection occurs via inhalation of organisms. It is usually spread by aerosolized organisms from infected animal products, such as the placenta, but could be made into an aerosol and disseminated as a terrorist weapon. Person-to-person transmission rarely, if ever, occurs. Case fatality rates are usually below 1%.
2. **Health Effects:** The incubation period for Q fever ranges from 10 days to 3 weeks. The onset of symptoms may be sudden presenting with chills, fever, headache, pleuritic chest pain, cough, weakness, malaise, and severe sweats; or the onset may be insidious and present as a "fever of unknown origin." Pneumonia is present in some cases, but pulmonary symptoms are usually not prominent. Person-to-person transmission rarely, if ever, occurs. Case fatality rates are usually below 1%. Patients are not generally critically ill, and the illness lasts from 2 days to 2 weeks. Q fever is self-limited, resolving even without treatment. Q fever endocarditis is rare and much more difficult to treat.
3. **Patient Decontamination/Evaluation:** Patients who are exposed to Q fever by aerosol transmission do not present a risk for secondary contamination or re-aerosolization of the organism. Decontamination is accomplished with soap and water or by the use of weak (0.5 percent) hypochlorite solutions. Wash the ambulance

interior if necessary and wipe with dilute (0.5%) chlorine bleach or other appropriate disinfectant.

#### 4. Prehospital Patient Treatment:

- a. Evaluate patient for dehydration and shock (which would suggest an alternate diagnosis). If effects are mild, it might be practical to send the patient for medical care via private conveyance; hospitalization may not be necessary.
- b. IV fluids are not usually necessary, but if the patient's condition suggests dehydration or the possibility of some other diagnosis, obtain IV access and run Lactated Ringer's or normal saline at KVO.
- c. Transport the patient to the most appropriate medical facility as directed by medical consultation.

**NOTE: Prophylaxis:** Treatment with tetracycline 500mg every six hours or doxycycline 100 mg every 12 hours, starting between the 8th to 12th day postexposure and continued for 5 days, should prevent the onset of symptoms. Doxycycline and tetracycline are contraindicated in children less than 8 years old and in pregnant women. In children 8 years and older, the dose of doxycycline for children weighing less than 45 kg is 2.2 mg/kg every 12 hours and for those weighing more than 45 kg, the dose is 100 mg every 12 hours. The dose of tetracycline for children is 6.25-12.5 mg every six hours. An inactivated whole cell vaccine (currently in the investigative stage) is effective in eliciting protection against exposure, but severe local reactions to this vaccine may be seen in those who already possess immunity.

## Smallpox

1. **General:** Smallpox is an acute, contagious, and sometimes fatal disease caused by the *variola* virus (an orthopoxvirus), and marked by fever and a distinctive progressive skin rash. In 1980, the disease was declared eradicated following worldwide vaccination programs. However, in the aftermath of the events of September and October, 2001, the U.S. government is taking precautions to be ready to deal with a bioterrorist attack using smallpox as a weapon. As a result of these efforts: 1) There is a detailed nationwide smallpox preparedness program to protect Americans against smallpox as a biological weapon. This program includes the creation of preparedness teams that are ready to respond to a smallpox attack on the United States. Members of these teams – health care and public health workers - are being vaccinated so that they might safely protect others in the event of a smallpox outbreak. 2) There is enough smallpox vaccine to vaccinate everyone who would need it in the event of an emergency. Smallpox is infectious only for humans; there is no known animal reservoir or insect vector. Historically, 1 out of 3 people who contracted the disease died. The last U.S. case of smallpox was reported in 1949 in Texas. The last occurrence of endemic smallpox was in Somalia in 1977 and the last case in the world was a laboratory-acquired infection in 1978.
2. **Health Effects:** A person with smallpox is sometimes contagious with onset of fever (prodrome phase), but the person becomes most contagious with the onset of rash. The infected person is contagious until the last smallpox scab falls off. The symptoms appear between 7 and 17 days following infection. Symptoms begin with sudden

onset of fever, headache, backache, vomiting, and delirium. A reddening of the skin may appear for a short time followed in 2-3 days after onset of illness with a pustule type rash, which begins on the face, hands, forearms, and spreads to the legs and centrally to the trunk. Lesions begin to form crusts on about the eighth or ninth day.

**3. Patient Decontamination/Evaluation:** Decontamination is accomplished with soap and water or the use of weak (0.5 percent) hypochlorite solutions. Smallpox can be prevented through use of the smallpox vaccine. There is no proven treatment for smallpox, but research to evaluate new antiviral agents is ongoing. Patients with smallpox can benefit from supportive therapy (e.g., intravenous fluids, medicine to control fever or pain) and antibiotics for any secondary bacterial infections that may occur.

**4. Prehospital Patient Treatment:**

- a. Obey strict isolation precautions. Cover open lesions with dry sheet. Evaluate for respiratory compromise. Apply supplemental Oxygen. If respiratory compromise is evident, and pulse oximetry is less than 90%, consider CPAP. If patient is in florid respiratory failure, intubation is warranted.
- b. Evaluate patient for dehydration and shock (which would suggest an alternative diagnosis). If effects are mild, it might be practical to send the patient for medical care via private conveyance; hospitalization may not be necessary.
- c. IV fluids are not usually necessary, but if the patient's condition suggests dehydration or the possibility of some other diagnosis, obtain IV access and run lactated Ringer's or normal saline at KVO.
- d. Transport the patient to the most appropriate medical facility as directed by medical consultation.

**NOTE: Prophylaxis:** The smallpox vaccine is the only way to prevent smallpox. The vaccine is made from a virus called *vaccinia*, which is another “pox”-type virus related to smallpox but cannot cause smallpox. The vaccine helps the body develop immunity to smallpox. It was successfully used to eradicate smallpox from the human population. Vaccination within 3 days of exposure will completely prevent or significantly modify smallpox in the vast majority of persons. Vaccination 4 to 7 days after exposure likely offers some protection from disease or may modify the severity of disease. Routine vaccination of the American public against smallpox stopped in 1972 after the disease was eradicated in the United States. Until recently, the U.S. government provided the smallpox vaccine only to a few hundred scientists and medical professionals who work with smallpox and similar viruses in a research setting. After the events of September and October, 2001, however, the U.S. government took further actions to improve its level of preparedness against terrorism. For smallpox, this included updating a response plan and ordering enough smallpox vaccine to immunize the American public in the event of a smallpox outbreak. The plans are in place, and there is sufficient vaccine available to immunize everyone who might need it in the event of an emergency. In addition, in December of 2002, the Bush Administration announced a plan to better protect the American people against the threat of smallpox attack by hostile groups or governments. This plan includes the creation of smallpox healthcare teams that would respond to a smallpox emergency. Members of these teams are being vaccinated against smallpox. The plan also included vaccination of certain military and civilian personnel who are or

may be deployed in high threat areas. There is no proven treatment for smallpox, but research to evaluate new antiviral agents is ongoing. Early results from laboratory studies suggest that the drug cidofovir may fight against the smallpox virus; currently, studies with animals are being done to better understand the drug's ability to treat smallpox disease (the use of cidofovir to treat smallpox or smallpox reactions is being evaluated and monitored by experts at NIH and CDC).

***ROUTINE VACCINATION IS NOT CURRENTLY IN THE EMS SCOPE OF PRACTICE.***

***In the event of a smallpox outbreak, EMS may be called upon to give immunizations to the population at large, but this measure must be authorized emergently by the Governor of Ohio or the Director of the Ohio Department of Health.***

## **Tularemia**

- 1. General:** Tularemia, also known as rabbit fever or deer fly fever, is caused by *Franciscella tularensis*. The bacteria is transmitted to humans by skin contact, inhalation, or ingestion of the bacteria, but can also be transmitted by ticks and deer flies. It has been found in many mammalian animals, but has also been found in cat bites and in fish. A minimal amount of bacteria is required to cause an infection via penetration of the skin or inhalation.
- 2. Health Effects:** The average incubation period is 2-5 days, but may be as long as 2 weeks. The infection begins as a skin nodule that develops into an enlarged ulcer with a black base. The patient develops fever, muscle aches, and marked, diffuse swelling and tenderness of the lymph nodes. The eyes are can be a portal of infection and patients may present with eye drainage and lymph node enlargement in the head and neck. Inhalation of the bacteria will result in the patient developing cough, dyspnea, pleuritic chest pain, and bilateral pneumonia. Patients who ingest the bacteria in large amounts will have nausea, vomiting, diarrhea, and gastrointestinal bleeding.
- 3. Patient Decontamination/Evaluation:** The patient's clothing should be removed and the patient's body should be washed with soap and water. Visibly contaminated areas of the skin should be cleaned with dilute (0.5%) chlorine bleach. Contaminated equipment should be cleaned with 10% chlorine bleach.
- 4. Prehospital Patient Treatment:**
  - a. Evaluate the patient for the presence of cutaneous nodules or ulcers, and fever.
  - b. Administer oxygen and assess pulse oximetry for those patients with respiratory symptoms.
  - c. Cover open lesions with a dry sheet or dressing.
  - d. Obtain an IV of normal saline or lactated Ringer's at KVO. Administer a fluid bolus to support the blood pressure if the patient is hypotensive or clinically dehydrated.
  - e. Transport the patient to the most appropriate medical facility as directed by medical direction. Antibiotic therapy will be initiated there.

**NOTE: Prophylaxis:** Streptomycin 1 gm IM twice for adults will prevent the development of tularemia in people who are incubating the bacteria. The dose for streptomycin for children ages 2-12 is 10-20 mg/kg IM twice a day. Children under 2 years of age should receive gentamicin 2.5 mg/kg IM every eight hours and newborns less than 14 days of age should receive gentamicin 2.5 mg/kg IM every twelve hours. Pregnant women should receive gentamicin 1-1.7mg/kg IM with subsequent doses based on measured drug blood levels. There is also a multiple dose vaccine available that is given primarily to high-risk individuals (veterinarians, game warden, hunters, etc.)

## **BLISTER AGENTS**

### **Mustard (Sulfur Mustard)**

- 1. General:** Mustard causes no immediate effects. Clinical effects begin from 2 to 24 hours (usually within 4 to 8 hours) following exposure to liquid mustard or to mustard vapor. Liquid or vapor mustard penetrates the skin and mucous membranes and damages cells within minutes of exposure, so decontamination must be done immediately after exposure.
- 2. Health Effects:** The initial clinical effects of mustard usually involve redness, itching, and burning of the eyes or skin, epistaxis, hoarseness, sinus pain, or cough. Inhalation results in irritation of nose, voice change, sinus pain, and hacking cough. Exposure to the skin will result in erythema that will progress to blisters in 1 to 4 hours if a significant exposure occurred. Exposure to high doses of this agent may lead patients to present with corneal damage, visible blisters, vomiting, diarrhea, bone marrow damage, and a productive cough. Although uncommon, extremely large exposures may result in a patient developing plus dyspnea within 2 hours. Patients with this degree of exposure should be intubated, and assisted ventilation with oxygen should be started.
- 3. Patient Decontamination/Evaluation:** The patient should be removed from the toxic environment immediately. If the patient has been exposed to liquid mustard, the clothing should be removed and the skin decontaminated with soap and cool water, or thoroughly flushed with water alone. The patient's eyes should be flushed with large amounts of saline. If the patient has been exposed to vapor alone, remove the clothing. If there is a history of definite exposure, the patient should be taken to a medical facility for observation.
- 4. Prehospital Patient Treatment:**
  - a. The treatment for asymptomatic patients exposed to mustard is decontamination. Tissue is damaged within minutes, so decontamination must be performed immediately.
  - b. Eyes: Flush copiously with saline.
  - c. Skin: Rinse with saline. Leave small blisters intact. Fluid requirements are much less than those for thermal burns; but intravenous fluids are recommended. Start IV normal saline and give 1 liter en route for adults.

d. **Respiratory:** Albuterol metered dose inhaler or albuterol nebulized aerosol in unit dose.

If respiratory failure, intubation; assisted ventilation with oxygen may be necessary. Pulmonary edema is non-cardiac in nature. **Use CPAP.**

## **BLOOD AGENTS**

### **Cyanide**

1. **General:** Cyanide blocks the use of oxygen in cells of the body. The odor of bitter almonds may be detected (half of the population cannot smell this). Antidotes (nitrites and thiosulfate) are very effective if administered in time.
2. **Health Effects:** High concentrations of vapor may cause a brief increase in rate and depth of breathing (in 15 seconds), seizures (30 seconds), cessation of breathing (3-5 minutes), cardiac arrest (4-10 minutes), and death. A smaller concentration will cause headache, flushing, light-headedness, and other nonspecific effects. These effects include irritation of the eyes, the nose, and the airways, agitation, vertigo, weakness, nausea, and muscular tremors. A large exposure may result in prolonged neurologic damage, probably because of hypoxia.  
Victims of cyanide exposure may also have normal pupils (may be dilated in terminal stage), "cherry-red" skin (may not be present), and diaphoresis. Chronic ingestion of cyanide-containing foods (e.g., cassava, which is a staple in many parts of Africa) has been associated with thyroid and nerve disturbances. Cyanosis occurs only after circulatory collapse and apnea.
3. **Patient Decontamination/Evaluation:** The patient should be removed from the toxic environment immediately. Cyanide is very volatile so there is little need for decontamination if the exposure was to vapor alone. If liquid cyanide is present, remove patient's clothing and wash liquid off skin. The effects of vapor from either form of cyanide appear within seconds to a minute. If patient has no or only mild effects when seen 5 to 30 minutes after exposure, no treatment is required.
4. **Prehospital Patient Treatment:**
  - a. For a mild exposure (conscious and breathing): observe; no antidotes; oxygen may be given to adult or pediatric patients in the presence of a patient experiencing the mild symptoms of heart disease.
  - b. Severe exposure (unconscious, not breathing): should immediately receive 100% oxygen. Antidotes should be administered as soon as possible (see below). It is important to note that pulse oximeter results are completely unreliable in the setting of methemoglobinemia, which is induced by amyl nitrite or sodium nitrite therapy.  
There are two cyanide antidote kits that are currently available, the Cyanide Antidote Kit and the Cyanokit. The Cyanide Antidote Kit amyl nitrite, sodium nitrite (300mg/10ml), and sodium thiosulfate (12.5 grams/50ml). The Cyanokit, contains hydroxocobalamin, a precursor of vitamin B12. Hydroxocobalamin can cause intense redness and flushing of the skin and a temporary pink discoloration

of the urine; however, it does not produce methemoglobin like the Cyanide Antidote Kit.

- c. For a severe exposure: Ventilate using bag-valve-mask with one ampule of amyl nitrite (crushed) in bag; after several minutes add another (crushed) ampule; keep adding an ampule every several minutes. This is a temporary measure until IV medications can be given, but it may assist in recovery.
- d. Administer 300 mg (10 ml) of sodium nitrite IV over 5 minutes. Flush line. [Children's dose: 0.2-0.3 ml/kg, or 6-9 mg/kg of the 3% solution. No separate recommendation for infants. For elderly, use adult dose unless small and frail.] Be aware: Nitrites produce orthostatic hypotension, but a patient who can stand does not need them.

**OR**

Administer hydroxocobalamin 70mg/kg IV (not to exceed 5-10 grams) over 30 minutes. A second dose and subsequent doses (not to exceed 15 grams) may be administered for persistent or prolonged periods of cardiac arrest or collapse.

**NOTE:** Hydroxocobalamin administration is approved for the use in pediatrics and pregnancy.

- e. Follow with 12.5 grams (50 ml) of sodium thiosulfate IV. [Children's dose: 0.4 mg/kg, or 1.65 ml/kg of the 25% solution. No separate recommendation for infants. Adult dose should be used for elderly unless they are small and frail. Use care in giving nitrite in a patient with hypertension or heart disease.] (Amyl nitrite, sodium nitrite, and sodium thiosulfate are in the Pasadena (formerly Lilly) Cyanide Antidote Kit, the latter two in ampules of 300 mg/10 ml and 12.5 grams/50 ml.). Use one-half dose in 20 minutes if no improvement. See instructions on top of Antidote Kit box.
- f. If patient continues to remain apneic, intubate and continue oxygen through tube with assisted ventilation.
- g. Transfer unconscious patients to medical facility. Maintain airway.
- h. Apply Oxygen. Patients often recover rapidly unless CNS hypoxia has occurred.

## **CHOKING AGENTS**

### **Chlorine**

1. **General:** Chlorine is found as a greenish-yellow gas. There is a pungent, acrid, characteristic odor.
2. **Health Effects:** Chlorine exposures irritate the eyes and central (upper) airways within minutes. Low doses produce some cough and choking sensation. Moderate doses also produce a sense of suffocation, hoarseness, and substernal pain. High doses also produce a severe dyspnea, with pulmonary edema, nausea, vomiting, headache, and syncope. Very high doses may produce sudden death without obvious pulmonary lesions, possibly via laryngospasm. All recognized exposures should be referred for direct observation/care. Liquid contamination causes eye and skin burns on contact.

**3. Patient Decontamination/Evaluation:** The victim should be immediately removed from the toxic environment by fully masked personnel. Chemically protective clothing is required for liquid/solution exposures. Contaminated clothing should be removed and properly disposed.

**4. Prehospital Patient Treatment:**

**Apply OXYGEN**

- a. **Eyes:** Liquid exposures should be flushed with copious quantities of water; medical attention should be sought. Gas exposures, if symptomatic, should be flushed with water. Medical attention should be sought if symptomatic.
- b. **Skin:** Liquid exposures should be flushed with copious quantities of water. Contaminated clothing should be removed and disposed. Gas exposures require no specific therapy unless symptomatic. Intense gas exposure produces burns; wash with water.
- c. **Breathing:** Evaluate respiration, check for cyanosis and bronchospasm.

If apneic: **BLACK TAG, DO NOT** initiate CPR with intubation. Be aware that laryngospasm may be present with intense exposures; hence intubation may be very difficult.

If stridorous/hoarse: Consider intubation under direct visualization since laryngospasm may be imminent (see above). Medical attention should be sought.

If dyspnea/cough/chest tightness: Consider intubation for impending pulmonary edema. Medical attention should be sought. Albuterol nebulization may be helpful. Cricothyrotomy could be required.

**Adult:**

Inhaled albuterol: Unit dose or continuous based on symptoms

Steroids: methylprednisolone, load 125 mg IV push

**Infants and children (0-12 yr.):**

Inhaled albuterol: 2.5 mg per nebulized dose, may provide continuous with medical control approval.

Steroids: methylprednisolone: 1 mg/kg IV or IM

If pulmonary edema: Treat as noncardiac pulmonary edema (Adult Respiratory Distress Syndrome or ARDS) Apply BiPAP or CPAP. Avoid diuretic therapy.

## Methyl Isocyanate, Methylene Bisphenyl Isocyanate, and Methylene Diisocyanate (MDI)

- 1. General:** MDI is found as a solid, which has a melting point of 37°C. Vapor exposures occur with liquids containing dissolved solid. Gas exposures may occur with high-temperature volatilization. Thermal decomposition produces carbon monoxide and oxides of nitrogen. Sensitivity to this substance (eye, nose irritation) occurs at concentrations five times higher than OSHA limits (0.2 mg/cubic meter); hence toxic exposures may go unrecognized.
- 2. Health Effects:** The eyes, mucous membranes, and skin may be irritated, particularly with prolonged, repetitive, or intense exposures. High concentrations may also produce cough, dyspnea, and lethal pulmonary edema. Respiratory sensitization may occur, particularly in individuals with known asthma, allergies, or recognized isocyanate sensitivity (e.g., TDI).
- 3. Patient Decontamination/Evaluation:** The victim should be immediately removed from the toxic environment by personnel wearing chemically protective clothing and full (positive pressure) masks. Liquid/solid contamination should be addressed by clothing removal and soap and water decontamination.
- 4. Prehospital Patient Treatment:**

- a. Eyes:** There is no specific therapy appropriate. Liquid/solid exposures should be irrigated with copious quantities of water. Subsequently symptomatic individuals should seek medical attention.
- b. Skin:** There is no specific therapy appropriate. Liquids/solids should be removed with soap and water.
- d. Respiratory:** Apply oxygen. Give unit dose of albuterol. Symptoms due to sensitivity may be delayed up to 8 hr after exposure. Respiratory symptoms may appear with skin, ocular, or GI exposure in previously sensitized individual.

If apneic: **BLACK TAG: DO NOT** Initiate CPR.

If stridorous/hoarse: Consider intubation under direct visualization.

If dyspnea/cough/chest tightness: Consider intubation for impending pulmonary edema.]

Intubation may be required for pulmonary edema. Consider severe bronchospasm in previously sensitized victim.

### Adults:

Inhaled albuterol: unit dose, or continuous.  
Steroids: methylprednisolone load 250 mg IV

### Infants and children (0-12 yr.):

Inhaled albuterol: 0.15 mg/kg per nebulized dose or continuous with medical control approval.  
Steroids: methylprednisolone; 1 mg/kg IM or IV

## **EXPLOSIVE AGENTS**

In general, the treatment for explosive agents will be the same as for multiple trauma. However, aggressive respiratory and airway management must be undertaken. Because air-filled structure like the lung, gut, and middle ear are sensitive to changes to the rapid change in pressure caused by an explosion, they may rupture.

### **Prehospital Treatment:**

- a. If a patient has survived an explosion, but has lost hearing, give oxygen and transport rapidly. If there was enough change in pressure to rupture the eardrums, there was enough to rupture the alveoli. The patient may suffer from Adult Respiratory Distress Syndrome within hours. Administer oxygen. If wheezing is present, the patient may need CPAP. Albuterol aerosols do NOT help in these cases.
- b. Establish IV access and administer normal saline or lactated Ringer's at KVO.
- c. Splint all fractures.
- d. If the patient complains of abdominal pain, treat as per abdominal pain protocol. The pain may be from a ruptured intestine.
- e. Transport to a trauma center.

Although the treatment of victims of explosive agents in the prehospital setting is the same as multiple trauma victims, the establishment and maintenance of scene safety presents unique challenges. The perimeters of the hot and cold zones are dependent upon the type and location of the confirmed or suspected explosive agent. The Department of Homeland Security has established a set of guidelines to assist EMS professionals and other public safety officers to more accurately estimate the need for scene evacuation and establishing the boundaries of the safe scene. The 2009 Department of Homeland Security bomb threat stand-off chart below is a valuable tool for this purpose.



## BOMB THREAT STAND-OFF CHART

Threat Description Improvised Explosive Device (IED)	Explosives Capacity <sup>1</sup> (TNT Equivalent)	Building Evacuation Distance <sup>2</sup>	Outdoor Evacuation Distance <sup>3</sup>
 Pipe Bomb	5 LBS	70 FT	1200 FT
 Suicide Bomber	20 LBS	110 FT	1700 FT
 Briefcase/Suitcase	50 LBS	150 FT	1850 FT
 Car	500 LBS	320 FT	1500 FT
 SUV/Minivan	1,000 LBS	400 FT	2400 FT
 Small Moving Van/ Delivery Truck	4,000 LBS	640 FT	3800 FT
 Moving Van/ Water Truck	10,000 LBS	860 FT	5100 FT
 Semi-Trailer	60,000 LBS	1570 FT	9300 FT

1. These capacities are based on the maximum weight of explosive material that could reasonably fit in a container of similar size.
2. Personnel in buildings are provided a high degree of protection from death or serious injury; however, glass breakage and building debris may still cause some injuries. Unstrengthened buildings can be expected to sustain damage that approximates five percent of their replacement cost.
3. If personnel cannot enter a building to seek shelter they must evacuate to the minimum distance recommended by Outdoor Evacuation Distance. These distance is governed by the greater hazard of fragmentation distance, glass breakage or threshold for ear drum rupture.

Since September 11, 2001, our nation has experienced an increase in home-grown terrorism. Via various media outlets, instructions to make improvised explosive devices (IEDs) with materials and containers are readily available and early accessible to the general public. On August 22, 2013, the Emergency Medical, Fire, and Transportation Services Board approved the addition of the following chart to this document to provide additional information to support EMS providers when faced with a variety of smaller IEDs.

Threat	Threat Description	Explosive Capacity	Building Evacuation Distance	Outdoor Evacuation Distance
	Small Package/letter	1 lb	40 ft	900 ft
	Pipe Bomb	5 lb	70 ft	1,200 ft
	FedEx Package	10 lb	90 ft	1,080 ft
	Vest/Container Bombs	20 lb	110 ft	1,700 ft
	Parcel Package	50 lb	150 ft	1,850 ft
	Compact Car	500 lb	320 ft	1,900 ft
	Full Size Car/Minivan	1,000 lb	400 ft	2,400 ft
	Van/SUV/Pickup Truck	4,000 lb	640 ft	3,800 ft
	Delivery Truck	10,000 lb	860 ft	5,100 ft

## NERVE AGENTS

### (GA, GB, GD, GF, VX)

1. **General:** Nerve agents are extremely toxic chemicals that cause effects by inhibiting the enzyme acetylcholinesterase, allowing excess acetylcholine to accumulate. This excess neurotransmitter then produces overstimulation and causes hyperactivity in muscles, glands, and nerves. The nerve agents are GA (tabun), GB (sarin), GD (soman), GF, and VX. Their clinical effects are identical.

*Note: The primary purpose of Mark I<sup>®</sup> kits, Duodote<sup>®</sup>, ATNAA<sup>®</sup> (Antidote Treatment-Nerve Agent, Auto-injector), and other nerve agent antidote auto-injector kits is administration to the EMS professional. The rationale behind having a nerve agent antidote auto-injector kit is that the rescuers themselves may begin to have symptoms of nerve agent or organophosphate poisoning. If signs and symptoms arise, the rescuer is to use the nerve agent auto-injector antidote kit on himself and assist their partner in the administration of the contents of the kit. The atropine and 2-PAM in nerve agent antidote auto-injector kits will not completely reverse the effects, but may be enough to prevent cardiopulmonary collapse and allow you to make it to a hospital for definitive care. Use or deployment of nerve agent antidote auto-injector kits should be in known or suspected nerve agent or organophosphate exposures and with the incident*

2. **Health Effects:** Nerve agents are the most toxic chemical agents. Initial effects from small amounts of a nerve agent differ, depending on the route of exposure. After a small vapor exposure, there is the immediate onset of effects in the eyes (small or pinpoint pupils [miosis], redness, eye pain, and dim vision), the nose (rhinorrhea), and airways (shortness of breath secondary to bronchoconstriction and secretions). After a small liquid exposure, there may be an asymptomatic interval of up to 18 hours before the onset of sweating and fasciculations at the site of the droplet, which may be followed by nausea, vomiting, and diarrhea. After exposure to a large amount of nerve agent by either route, there is sudden loss of consciousness, convulsions, copious secretions, apnea, and death. There is usually an asymptomatic interval of minutes after liquid exposure before these symptoms occur. Effects from vapor occur almost immediately. Antidotes (atropine and pralidoxime) are effective if administered before circulation fails. **SLUDGEM** is a mnemonic used to describe the signs and symptoms of nerve agent poisoning. **SLUDGEM** stands for Salivation, Lacrimation, Urination, Gastrointestinal upset, Emesis, and Miosis or Muscle twitching.
3. **Patient Decontamination/Evaluation:** If exposure was to vapor, remove clothing; if exposure was to liquid, remove clothing and wash skin with soap and water, or thoroughly flush with water alone.
4. **Prehospital Patient Treatment:**

If the patient is conscious, note ventilatory status and ask about nausea. If the patient is unconscious, note ventilatory status and heart rate (heart rate may be high, low, or normal in a nerve agent casualty). Initial effects differ depending on whether

exposure was to vapor or to liquid. Initiation of treatment should not be based upon heart rate.

If the patient is exposed to vapor, the symptoms start within seconds to a minute or two. For mild to moderate exposures, the patient will have miosis, rhinorrhea, excess secretions, or dyspnea. A severe exposure to vapor will cause loss of consciousness, seizures, apnea, and flaccid paralysis.

For the liquid form, a mild to moderate exposure will cause sweating and fasciculations at site of exposure, nausea, vomiting, diarrhea, or weakness. A severe exposure will cause the same symptoms, but there will only be a 1- to 30-minute asymptomatic period.

a. Initial Management:

- (1) Mild to moderate: Dyspnea should be treated with one or two doses of atropine IM or IV and 1 dose of pralidoxime (IV infusion) initially, depending on the severity of the dyspnea. (See paragraph b below for dosage information.) This should be supplemented with oxygen, particularly in infants, young children, and the elderly; healthy older children and adults will usually do well without it unless they have pulmonary or cardiac disease. The atropine dose should be repeated at 7- to 10-minute intervals until clinical improvement is noted. Failure to respond (i.e. no dry mouth, no decrease in secretions) confirms the need to administer additional doses of atropine. Gastrointestinal effects after a liquid exposure is treated in the same manner. Do not treat for miosis (unless eye pain is severe) or rhinorrhea (unless severe).
- (2) Severe: Administer 3 doses of atropine IM (not IV in hypoxic patient) and start 1 dose of pralidoxime by slow (20 minutes) IV drip. [More rapid administration will cause hypertension.] (See paragraph b below for size of dose.) Intubate and ventilate with oxygen (initial ventilation will be difficult because of airway resistance; atropine will relieve this). Administer diazepam 5mg IV push or IM if the patient is convulsing, may be repeated once. Suction for secretions. Repeat one dose of atropine (IM until hypoxia is improved, then IV) every 5 minutes until (a) secretions diminish or (b) airway resistance is less or is normal. Failure to respond (i.e. no dry mouth, no decrease in secretions) confirms the need to administer additional doses of atropine. Monitor via pulse oximeter; cardiac monitoring should also be done (cardiac arrhythmias are uncommon after atropine is given). Acidosis may develop after seizures or after period of hypoxia and will require therapy. This patient should be transported to a hospital after stabilization (adequate drug therapy and initiation of ventilation).

b. Recommended Doses:

**Atropine:**

**Older child and adult:** 2 mg every 5 minutes IV or IM until excessive secretions diminish

**Infant and young child:** 0.02 mg/kg IV or 0.05 mg/kg IM until excessive secretions diminish

**Pralidoxime:**

**Older child and adult:** 1 gram IV or IM (If IM 600 mg to 1.2 grams)

**Infant and young child:** 25-50 mg/kg IV or IM

**Diazepam:**

**Older child and adult:** 5-10 mg IV or IM (maximum total dose of 10 mg)

**Infant and young child:** 0.2 mg/kg IV or 0.5 mg/kg IM or 0.5 mg/kg rectally (maximum total dose of 5 mg)

**Considerations during use of auto-injector antidote kits:** *As stated in Ohio Administrative Code 4765-6-05, all certified Ohio EMS professionals may administer nerve agent antidote auto-injectors in response to a known or suspected nerve agent or organophosphate exposure.*

If an auto-injector is administered, a dose calculation prior to administration is not necessary and additional auto-injectors can be administered until secretions diminish. Pediatric AtroPen<sup>®</sup> auto-injectors containing 0.5 milligrams of atropine should be administered to children who appear to weigh up to 20 kilograms. The EMS professional can administer two pediatric AtroPen<sup>®</sup> auto-injectors simultaneously to an adult if adult AtroPen<sup>®</sup> auto-injectors containing 1 milligram of atropine are unavailable. A Mark I<sup>®</sup> kit consists of one auto-injector containing 2 milligrams of atropine and a second auto-injector containing 600 milligrams of 2-PAM. Duodote<sup>®</sup> and ATNAA<sup>®</sup> are solitary (i.e. one) auto-injectors that contain 2.1 milligrams of atropine and 600 milligrams of 2-PAM. Mark I<sup>®</sup> kits, Duodote<sup>®</sup>, and ATNAA<sup>®</sup> have not been approved for pediatric use by the FDA, but they can be the initial treatment for children of any age with severe symptoms of nerve agent poisoning. In order to be beneficial to the victim, a dose of 2-PAM should be administered shortly after the nerve agent exposure as it has minimal clinical effect if administration is delayed more than 36 hours after the exposure. Although a dose of 2-PAM should be administered early in the course of treatment, repeat doses should be reserved for patients who continue to exhibit respiratory distress. In the pediatric population, an overdose of 2-PAM may cause profound neuromuscular weakness and subsequent respiratory depression. In the adult population, especially for the geriatric victim, excessive doses of 2-PAM may cause severe systolic and diastolic hypertension, neuromuscular weakness, headache, tachycardia, and visual impairment. For the geriatric victim who may have underlying medical conditions, particularly impaired kidney function or hypertension, the EMS provider should consider administering the lower recommended adult dose of 2-PAM IV.

*Atropine is the primary antidote for a nerve agent exposure, and repeated doses should be administered liberally to victims.* If the contents of a Mark I<sup>®</sup> kit, Duodote<sup>®</sup>, or ATNAA<sup>®</sup> have been administered to these patients, the EMS provider should consider deferring the administration of additional 2-PAM auto-injectors from subsequent Mark I<sup>®</sup> kits dispensed to the victim.

## Organophosphates

- 1. General:** Organophosphates are toxic chemicals that are readily available for purchase by the general public as pesticides. Similar to the GA, GB, GD, GF, and VX, their effects are caused by inhibition of the enzyme acetylcholinesterase. The excess accumulated acetylcholine causes hyperactivity in muscles, glands, and nerves. Organophosphates penetrate tissues and bind to the patient's body fat

producing a prolonged period of illness even during aggressive treatment. They are extremely toxic whether they are ingested or make contact with the skin.

**Note: The primary purpose of Mark I<sup>®</sup> kits, Duodote<sup>®</sup>, ATNAA<sup>®</sup>, and other nerve agent antidote auto-injector kits is administration to the EMS professional. The rationale behind having a nerve agent antidote auto-injector kit is that the rescuers themselves may begin to have symptoms of organophosphate or nerve agent poisoning. If signs and symptoms arise, the rescuer is to use the nerve agent auto-injector antidote kit on himself and assist their partner in the administration of the contents of the kit. The atropine and 2-PAM in nerve agent antidote auto-injector kits will not completely reverse the effects, but may be enough to prevent cardiopulmonary collapse and allow you to make it to a hospital for definitive care. Use or deployment of nerve agent antidote auto-injector kits should be in known or suspected organophosphate or nerve agent exposures and with the incident commander's or medical commander's authority.**

2. **Health Effects:** The patient will develop miosis (pinpoint pupils), bronchospasm, vomiting, and excessive secretions in the form of tearing, salivation, rhinorrhea, diarrhea, and urination. Penetration of the organophosphate in the CNS system will cause headache, confusion, generalized muscle weakness, seizures, and lethargy or unresponsiveness. The onset of symptoms can be immediate with an exposure to a large amount of the agent. Patients with low-dose chronic exposures may have a more delayed presentation of symptoms. **SLUDGEM** is a mnemonic used to describe the signs and symptoms of organophosphate poisoning. **SLUDGEM** stands for Salivation, Lacrimation, Urination, Gastrointestinal upset, Emesis, and Miosis or Muscle twitching.
3. **Patient Decontamination/Evaluation:** Remove the patient's clothing and wash the skin thoroughly with soap and water.
4. **Prehospital Patient Treatment:**
  - a. Assess the patient's respiratory status, mental status, and pupillary status. The heart rate may be normal, bradycardic, or tachycardic. Initiation of treatment should not be based upon heart rate.
  - b. Apply oxygen.
  - c. Establish an IV of normal saline.
  - d. Apply a cardiac monitor immediately.
  - e. Atropine in extremely large doses is the antidote. Atropine should be given repeatedly until the patient's secretions resolve. Pralidoxime is a secondary treatment and should not be given until the patient is fully has had sufficient atropine to control the secretions.
  - f. The stock of atropine and pralidoxime available to prehospital professionals is usually not sufficient to fully treat the victim of an organophosphate exposure. Initiate the administration of atropine and pralidoxime.
  - g. Seizures should be treated with diazepam 5 mg IV or IM (0.2-0.5 mg/kg IV or IM for infants and children)
  - h. Morphine, furosemide (Lasix<sup>®</sup>), theophylline, or aminophylline are contraindicated in organophosphate poisonings and should not be given.

- i. Immediately transport to the closest appropriate medical facility as directed by medical consultation.
- j. Recommended doses:

**Atropine:**

**Adult and older child:** 2-5 mg IV or IM every 5 minutes until excessive secretions diminish

**Infant and young child:** 0.05 mg/kg IV or IM every 5 minutes until excessive secretions diminish

**Pralidoxime:**

**Adult and older child:** 1-2 gm IV or IM

**Infant and young child:** 25-50 mg/kg IV or IM

**Considerations during use of auto-injector antidote kits:**

*As stated in Ohio Administrative Code 4765-6-05, all certified Ohio EMS professionals may administer nerve agent antidote auto-injectors in response to a known or suspected nerve agent or organophosphate exposure.*

If an auto-injector is administered, a dose calculation prior to administration is not necessary and additional auto-injectors can be administered until secretions diminish. Pediatric AtroPen<sup>®</sup> auto-injectors containing 0.5 milligrams of atropine should be administered to children who appear to weigh up to 20 kilograms. The EMS provider can administer two pediatric AtroPen<sup>®</sup> auto-injectors simultaneously to an adult if adult AtroPen<sup>®</sup> auto-injectors containing 1 milligram of atropine are unavailable. A Mark I<sup>®</sup> kit consists of one auto-injector containing 2 milligrams of atropine and a second auto-injector containing 600 milligrams of 2-PAM. Duodote<sup>®</sup> and ATNAA<sup>®</sup> are solitary (i.e. one) auto-injectors that contain 2.1 milligrams of atropine and 600 milligrams of 2-PAM. Mark I<sup>®</sup> kits, Duodote<sup>®</sup>, and ATNAA<sup>®</sup> have not been approved for pediatric use by the FDA, but they can be the initial treatment for children of any age with severe symptoms of organophosphate poisoning.

In order to be beneficial to the victim, a dose of 2-PAM should be administered shortly after the nerve agent exposure as it has minimal clinical effect if administration is delayed more than 36 hours after the exposure. Although a dose of 2-PAM should be administered early in the course of treatment, repeat doses should be reserved for patients who continue to exhibit respiratory distress.

In the pediatric population, an overdose of 2-PAM may cause profound neuromuscular weakness and subsequent respiratory depression. In the adult population, especially for the geriatric victim, excessive doses of 2-PAM may cause severe systolic and diastolic hypertension, neuromuscular weakness, headache, tachycardia, and visual impairment. For the geriatric victim who may have underlying medical conditions, particularly impaired kidney function or hypertension, the EMS provider should consider administering the lower recommended adult dose of 2-PAM IV.

*Atropine is the primary antidote for an organophosphate exposure, and repeated doses should be administered liberally to victims.* If the contents of a Mark I<sup>®</sup> kit, Duodote<sup>®</sup>, or ATNAA<sup>®</sup> have been administered to these patients, the EMS provider should consider deferring the administration of additional 2-PAM auto-injectors from subsequent Mark I<sup>®</sup> kits dispensed to the victim.

## Phosgene — Carbonyl Chloride

1. **General:** Phosgene may be found as a colorless liquid or a colorless-to-white gas. There is an odor of newly mown or moldy hay. Sensitivity to the odor may degrade, making individuals unaware of toxic inhalation. High-intensity exposure irritates eyes and upper airways within minutes. Lower-dose exposures may produce a lethal pulmonary edema with a characteristic symptom-free or "latent" period up to 48 hours later. Some pulmonary symptoms may appear as late as 72 hours after exposure. All recognized exposures should be referred for direct, in-hospital observation and care.
2. **Health Effects:** Phosgene gas at high concentrations may cause immediate irritation of the eyes and upper respiratory tract (nose, larynx, and trachea). This effect is thought to be due to breakdown of the gas to hydrochloric acid with water vapor contact. After resolution of this irritation, a symptom-free period may occur. During this period, progressive damage to the walls of the capillaries allows fluids to leak from those vessels and gradually compromise lung function. The individual complains of progressive cough, chest tightness, and shortness of breath. Frothy secretions typical of pulmonary edema occur. This can be so rapid as to cause death if the early symptoms are not recognized and treated.
3. **Patient Decontamination/Evaluation:** The victim should be immediately removed from the toxic environment by personnel with the appropriate PPE (positive pressure apparatus). Liquid contamination does not require additional protection for rescue personnel as there are minimal topical effects to the skin and no substantial dermal absorption.
4. **Prehospital Patient Treatment:**
  - a. Eyes: If exposed to liquid phosgene, eyes should be flushed with copious quantities of water. Eyes exposed to gas phosgene, if symptomatic, should be flushed with water.
  - b. Skin: Patients exposed to liquid phosgene should be flushed with copious quantities of water; contaminated clothing should be removed and disposed. Patients exposed to gas phosgene require no specific therapy unless symptomatic.
  - c. Ingested: Do not induce vomiting.
  - d. Respiratory: Evaluate respiration, cyanosis. Apply Oxygen.  
If apneic: **BLACK TAG, DO NOT** Initiate CPR. Be aware that laryngospasm may be present with intense exposures.

Due to the presence of laryngospasm, intubation may be very difficult.

If stridorous/hoarse: Consider intubation under direct visualization since laryngospasm may be imminent (see above).

If dyspnea/cough/chest tightness: Consider intubation for impending pulmonary edema. CPAP may be useful.

Cricothyrotomy if intubation is unsuccessful due to severe laryngospasm.

**Adult:**

Inhaled albuterol: unit dose or continuous for severe spasm.

Steroids: methylprednisolone, load 125 mg IV or IM

**Infants and Children (0-12 yr.):**

Inhaled albuterol: 2.5 mg per nebulized dose

Steroids: methylprednisolone: 1 mg/kg q 6 hr.

**Nuclear Agents**

1. **General:** “Dirty bombs” use radioactive material to contaminate a widespread area. The patient becomes contaminated through direct exposure to the radioactive source or from exposure to contaminated debris or liquids. The most severe exposures are from gamma radiation, the highest frequency ionizing rays, followed by beta radiation. Gamma rays penetrate the skin deeply, and beta radiation can penetrate nearly 1 centimeter of the skin’s thickness. Radioactive substances have prolonged damaging potential as they form radioactive “daughters” as the original substance decays. For example, as uranium decays, it produces a series of radon daughters, several of which produce gamma and beta radiation.
2. **Health Effects:** Radiation does not produce any immediate symptoms unless the exposure is severe. Tissues with rapid cell growth are most affected and thus, nausea and vomiting are the earlier symptoms. Skin burns can occur with direct contact with the radioactive substance, but the erythema of burns due to exposure is delayed in onset. Days to weeks after exposure, symptoms from bone marrow suppression develop and the patient may have fever, immunosuppression, petechiae, and spontaneous internal and external bleeding.
3. **Patient Decontamination/Evaluation:** Most patients with radiation will be asymptomatic initially. Universal precautions should be exercised and standard patient decontamination performed. Further decontamination should be performed on scene if patient stability permits. Exposed areas should be repetitively cleaned with soap and water until the dosimeter readings decrease to acceptable levels.
4. **Prehospital Patient Treatment:**
  - a. **Skin:** Wash all exposed areas repeatedly with soap and water until the dosimeter reading decreases to an acceptable level. Place contaminated towels, waste water, and body fluids in secured containers denoted for radioactive waste materials.
  - b. **Inhalation:** Administer oxygen and measures to support the airway, including albuterol aerosols and intubation if necessary. Inform personnel at the receiving facility of the inhalation exposure as they may need to urgently administer chelating or blocking agents or perform bronchopulmonary lavage to minimize the damage to lung tissues.
  - c. **Ingestion:** Gastric emptying with ipecac will not provide significant benefit and should not be given. All body fluids released from vomiting, urination, salivation, and defecation should be placed in plastic bags and secured in containers denoted for radioactive waste materials. Inform the personnel at the receiving facility of

the radioactive ingestion. They may need to urgently administer chelating or blocking agents to minimize the tissue damage.

- d. Potassium iodide: Potassium iodide (KI) blocks the uptake of radioactivity in the thyroid gland. The Ohio Department of Health may order prehospital personnel to take KI orally when there is a significant radioactive release or potential for exposure. The dose of KI may be determined by the Ohio Department of Health. Typically, the dose for protection from radiation is 130 mg daily for adults, 65 mg daily for children ages 3 and older up to a weight of 70 kg, 32 mg daily for children ages 1 month to 3 years, and 16 mg daily for infants less than one month of age.

***ADMINISTRATION OF POTASSIUM IODIDE (KI) IS NOT CURRENTLY IN THE SCOPE OF PRACTICE.***

***However, in cases of extreme emergency, upon the authorization of the Governor of Ohio or the Director of the Ohio Department of Health, EMS professionals may be called upon to distribute doses of potassium iodide in order to cover a large population.***