SUBJECT: WEAPONS OF MASS DESTRUCTION RESPONSE PLAN

PURPOSE:
MMSC or associated clinics may have the first opportunity to recognize and initiate a response to a Weapon of Mass Destruction (WMD) event. A WMD event could involve the use of biological, chemical or nuclear warfare agents. MMSC does have Infection Control policies in place authorizing the healthcare epidemiologist, Infection Control committee chairman, or designee to rapidly implement prevention and control measures in response to a suspected outbreak. Should a WMD event be suspected, a network of communication must be activated to involve Infection Control personnel, healthcare administration, public health and state health departments, the Federal Bureau of Investigation (FBI) field office, and CDC (see Reporting Requirements and Contact Information below).

The acronym B-NICE summarizes the range of weapons a terrorist might use:
- Biological – disease causing organisms
- Nuclear – dangerous radiation or radioactivity
- Incendiary – fire bombs
- Chemical – poisonous compounds
- Explosive – bombs, grenades, rockets, missiles, mines or similar devices

Rapid Reference

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Section I: General Categorical Recommendations for Any Suspected Bioterrorism Event

Reporting Requirements and Contact Information

MMSC may be the initial site of recognition and response to bioterrorism events. If a bioterrorism event is suspected, our local emergency response systems should be activated. Notification should immediately include infection control personnel, MMSC administration, and prompt communication with public health and state health departments, FBI field office, local police, CDC, and medical emergency services.

INTERNAL CONTACTS:
- ADMINISTRATION: Admin. On call 641-754-5151
- EPIDEMIOLOGIST: MMSC Lab 641-754-5080
- HAZ MAT FACILITATOR: Beth Grumstrup 641-754-5080
- INFECTION CONTROL: Barb Grabenbauer 641-754-5379
- LOCAL HEALTH DEPARTMENT: Pat Thompson 641-754-5022
- OCCUPATIONAL HEALTH & SAFETY: Barb Grabenbauer 641-754-5379
- PUBLIC RELATIONS: Liz Zuercher 641-754-5281
- RADIATION SAFETY OFFICER: Roy Struve 641-754-5086

EXTERNAL CONTACTS:
- BIOTERRORISM EMERGENCY NUMBER: CDC 770/488-7100
- CDC HOSPITAL INFECTIONS PROGRAM: 404/639-6413
- EMERGENCY MANAGEMENT: Marshall County 641-754-6385
  After hours 641-754-5725 or 911
  Iowa 515-281-3231
- FBI FIELD OFFICE: 402-493-8688
- IOWA POISON CONTROL: 800-352-2222
- LOCAL LAW ENFORCEMENT: 911 or 641-754-5725
- STATE HEALTH DEPARTMENT: Dr. Quinlisk 515-281-4941 or 515-281-4958
  or 800-362-2736
- US DEPARTMENT OF ENERGY: ISU 630-252-2402
- US DEPARTMENT OF PUBLIC DEFENSE: 515-252-4000

A. Building Security
In the event of an adverse community event, such as Weapon of Mass Destruction deployment, gang activity, strikes, etc., the Associate Director of Patient Care, Administrator on Call or the ED Physician and Charge Nurse should consider implementing the Facility Lock Down procedure.

B. “Concerned But Not Obviously Ill or Injured”
These individuals include those who think they may have signs and symptoms but don’t know, or those who have questions and concerns with the present issue to be addressed that do not need acute or emergency care.

Opening of a care site for these individuals may be required in response to an adverse community event. Such an event would be triggered by an anticipation of these individuals coming to the hospital in numbers larger than could be handled by hospital co-workers under the conditions created by the event. Triage and information to be used at the site will be determined by the scope of the incident.

Activation of the “Concerned But Not Obviously Ill or Injured” site would be a collaborative decision involving the Associate Director of Patient Care, the ED Physician, Emergency Management Services, Board of Health and the Iowa Department of Public Health. MMSC Home Care Plus will be the lead coordinating agency and decision-maker.

The location of this site will be determined at the time of the need, depending on availability of facilities. Fisher Community Center, the Coliseum, Iowa Veteran’s Home, High School or IVCCD are all possibilities to consider.
Biological Weapons of Mass Destruction

A. Potential Agents
   Four diseases with recognized bioterrorism potential (anthrax, botulism, plague, and smallpox) and the agents responsible for them are described in Section II of this document. The CDC does not prioritize these agents in any order of importance or likelihood of use.

B. Detection of Outbreaks Caused by Agents of Bioterrorism
   Bioterrorism may occur as covert events, in which persons are unknowingly exposed and an outbreak is suspected only upon recognition of unusual disease clusters or symptoms. Bioterrorism may also occur as announced events, in which persons are warned that an exposure has occurred. A number of announced bioterrorism events have occurred in the United States during 1998-1999, but these were determined to have been “hoaxes;” that is, there were no true exposures to bioterrorism agents. MMSC’s Bioterrorism Readiness Plan includes details for management of both types of scenarios. The possibility of a bioterrorism event should be ruled out with the assistance of the local law enforcement/FBI and state health officials.

1. Syndrome-based criteria
   Rapid response to a bioterrorism-related outbreak requires prompt identification of its onset. Because of the rapid progression to illness and potential for dissemination of some of these agents, it may not be practical to await diagnostic laboratory confirmation. Instead, it will be necessary to initiate a response based on the recognition of high-risk syndromes. Each of the agent-specific plans in Section II includes a syndrome description (i.e., typical combination of clinical features of the illness at presentation), that should alert healthcare practitioners to the possibility of a bioterrorism-related outbreak. If MMSC or associated clinic identify a potential outbreak, all facilities, clinics and offices will be notified by telephone and fax.

2. Epidemiological features
   Epidemiological principles must be used to assess whether a patient’s presentation is typical of an endemic disease or is an unusual event that should raise concern. Features that should alert healthcare providers to the possibility of a bioterrorism-related outbreak include:
   - A rapidly increasing disease incidence (e.g., within hours or days) in a normally healthy population.
   - An epidemic curve that rises and falls during a short period of time.
   - An unusual increase in the number of people seeking care, especially with fever, respiratory, or gastrointestinal complaints.
   - An endemic disease rapidly emerging at an uncharacteristic time or in an unusual pattern.
   - Lower attack rates among people who had been indoors, especially in areas with filtered air or closed ventilation systems, compared with people who had been outdoors.
   - Clusters of patients arriving from a single locale.
   - Large numbers of rapidly fatal cases.
   - Any patient presenting with a disease that is relatively uncommon and has bioterrorism potential (e.g., pulmonary anthrax, tularemia, or plague).

C. Infection Control Practices for Patient Management
   The management of patients following suspected or confirmed bioterrorism events must be well organized and rehearsed. Strong leadership and effective communication are paramount.

1. Isolation precautions
   Agents of bioterrorism are generally not transmitted from person to person; re-aerosolization of these agents is unlikely. All patients in healthcare facilities, including symptomatic patients with suspected or confirmed bioterrorism-related illnesses should be managed utilizing Standard Precautions. Standard Precautions are designed to reduce transmission from both recognized and unrecognized sources of infection in healthcare facilities, and are recommended for all patients receiving care, regardless of their diagnosis or presumed infection status. For certain diseases or syndromes (e.g., smallpox and pneumatic plague), additional precautions may be needed to reduce the likelihood for transmission. See Section II for specific diseases and requirements for additional isolation precautions.
Standard Precautions prevent direct contact with all body fluids (including blood), secretions, excretions, non-intact skin (including rashes), and mucous membranes. Standard Precautions routinely practiced by healthcare providers include:

- **Handwashing**
  Hands are washed after touching blood, body fluids, excretions, secretions, or items contaminated with such body fluids, whether or not gloves are worn. Hands are washed immediately after gloves are removed, between patient contacts, and as appropriate to avoid transfer of microorganisms to other patients and the environment. Either plain or antimicrobial-containing soaps may be used according to MMSC’s policy.

- **Gloves**
  Clean, non-sterile gloves are worn when touching blood, body fluids, excretions, secretions, or items contaminated with such body fluids. Clean gloves are put on just before touching mucous membranes and non-intact skin. Gloves are changed between tasks and between procedures on the same patient if contact occurs with contaminated material. Hands are washed promptly after removing gloves and before leaving a patient care area.

- **Masks/Eye Protection or Face Shields**
  A mask and eye protection (or face shield) are worn to protect mucous membranes of the eyes, nose, and mouth while performing procedures and patient care activities that may cause splashes of blood, body fluids, excretions, or secretions.

- **Gowns**
  A gown is worn to protect skin and prevent soiling of clothing during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, excretions, or secretions. Selection of gowns and gown materials should be suitable for the activity and amount of body fluid likely to be encountered. Soiled gowns are removed promptly and hands are washed to avoid transfer of microorganisms to other patients and environments.

2. **Patient placement**
   In small-scale events, routine MMSC patient placement and infection control practices should be followed. However, when the number of patients presenting to MMSC is too large to allow routine triage and isolation strategies (if required), it will be necessary to apply practical alternatives. These may include cohorting patients who present with similar syndromes, i.e., grouping affected patients into a designated section of the hospital, or a designated ward or floor, or even setting up a response center at a separate building. Designated alternate care sites have been chosen in advance by the Emergency Preparedness Committee, based on patterns of airflow and ventilation, availability of adequate plumbing and waste disposal, and capacity to safely hold potentially large numbers of patients. Triage will have controlled entry to minimize the possibility for transmission to other patients at the facility and to staff members not directly involved in managing the outbreak. At the same time, reasonable access to vital diagnostic services, e.g., radiography departments will be maintained.

3. **Patient transport**
   Most infections associated with bioterrorism agents cannot be transmitted from patient-to-patient. Patient transport requirements for specific potential agents of bioterrorism are listed in Section II. In general, the transport and movement of patients with bioterrorism-related infections, as for patients with any epidemiological important infections (e.g., pulmonary tuberculosis, chickenpox, measles), should be limited to movement that is essential to provide patient care, thus reducing the opportunities for transmission of microorganisms within MMSC.

4. **Cleaning, disinfecting, and sterilization of equipment and environment**
   Standard Precautions are used in all rooms and environmental cleaning. Special precautions are taken when in isolation. See Environmental Services policy #34, 34A, 35.

   Germicidal agents are used per policy. If bioterrorism is suspected the nursing staff/ or Infection Control will discuss any other precautions needed when cleaning is done.
MMSC uses Standard Precautions as outlined in 2007 CDC isolation Guidelines. See Infection Control Policies regarding isolation. Universal Precautions are also used for blood contact and the other potential infectious bodily fluids that can cause a bloodborne exposure.

The Spaulding Classification is used when reprocessing patient care equipment.

- Used patient-care equipment soiled or potentially contaminated with blood, body fluids, secretions, or excretions will be handled in a manner that prevents exposures to skin and mucous membranes, avoids contamination of clothing, and minimizes the likelihood of transfer of microbes to other patients and environments.
- Sterilization is required for all instruments or equipment that enter normally sterile tissues or through which blood flows.
- Rooms and bedside equipment of patients with bioterrorism-related infections should be cleaned using the same procedures that are used for all patients as a component of Standard Precautions, unless the infecting microorganism and the amount of environmental contamination indicates special cleaning. In addition to adequate cleaning, thorough disinfecting of bedside equipment and environmental surfaces may be indicated for certain organisms that can survive in the inanimate environment for extended periods of time. The methods and frequency of cleaning and the products used are determined by MMSC policy.
- Patient linen should be handled in accordance with Standard Precautions. Although linen may be contaminated, the risk of disease transmission is negligible if it is handled, transported, and laundered in a manner that avoids transfer of microorganisms to other patients, personnel and environments. See MMSC Infection Control Policy “Soiled Linen Collection.
- Contaminated waste should be sorted and discarded in accordance with federal, state and local regulations. Health and Safety Policy HS.5.3.2.

5. Discharge management

Ideally, patients with bioterrorism-related infections will not be discharged from the facility until they are deemed noninfectious. MMSC has developed instructions in the event that large numbers of persons exposed may preclude admission of all infected patients. Home care instructions will be distributed by the Emergency Room.

6. Post-mortem care

Pathology departments and clinical laboratories should be informed of a potentially infectious outbreak prior to submitting any specimens for examination or disposal. All autopsies should be performed carefully using all personal protective equipment and standards of practice in accordance with Standard Precautions, including the use of masks and eye protection whenever the generation of aerosols or splatter of body fluids is anticipated. The Funeral Directors Association has a plan for removal of the deceased.

D. Post Exposure Management

1. Decontamination of Patients and Environment

The need for decontamination depends on the suspected exposure and in most cases will not be necessary. The goal of decontamination after a potential exposure to a bioterrorism agent is to reduce the extent of external contamination of the patient and contain the contamination to prevent further spread. Decontamination should be considered anytime a potential contamination occurs. Decontamination of exposed individuals prior to receiving at MMSC may be necessary to ensure the safety of patients and staff while providing care. MMSC has a decontamination room and equipment needed to perform decontamination procedures. MMSC works in cooperation with Marshalltown Fire Department for additional resources and Marshall County contracts with Des Moines Hazard Material Response Team for specialized situations.

Decontamination requirements for specific potential agents of bioterrorism are listed in Section II.6 MMSC Emergency Room physicians will coordinate appropriate decontamination of patients according to listed
agents in Section II.

MMSC will cooperate with the FBI field office and CDC for collection of exposed clothing and potential evidence to the FBI or Department of Defense Laboratories.

2. **Prophylaxis and post-exposure immunization**
   Prophylaxis is subject to change. MMSC will follow recommendations for post-exposure prophylaxis and immunization as provided by CDC.

3. **Triage and management of large scale exposures and suspected exposures**
   Triage and management planning for large-scale events is included in the MMSC Emergency Plan.
   It includes:
   - Communication and lines of authority required to coordinate on-site care through ICS System.
   - Cancellation of non-emergency services and procedures should be considered.
   - Public Health and the Iowa Department of Public Health will assist in identifying sources able to supply available vaccines, immune globulin, antibiotics, and botulism anti-toxin. Planning for the efficient evaluation and discharge of patients.
   - ER will evaluate and discharge patients. Further on site care will be determined by the physician. ER will determine those that are non-contagious and give details regarding if and when they should return for care or if they should seek medical follow-up.
   - Department heads and administration will plan, determining availability and sources for additional medical equipment and supplies (e.g., ventilators) that may be needed for urgent large-scale care.
   - MMSC has a morgue capable of holding two to four cadavers. Any larger influx would require notification of the State Medical Examiner at 515-281-6726. The Medical Examiner will assist with the management of an increased number of cadavers.

4. **Psychological aspects of bioterrorism**
   Following a bioterrorism-related event, fear and panic can be expected from both patients and healthcare providers. Psychological responses following a bioterrorism event may include horror, anger, panic, unrealistic concerns about infection, fear of contagion, paranoia, social isolation, or demoralization. IC and public health professionals will contact Patient and Family Services to assist with the psychological aspects of such an event. Additional resources available would include the Mental Health Center of Mid-Iowa. The goal would be to minimize panic and treat anxiety of the patients, the public and the health care workers.

E. **Laboratory Support and Confirmation**
   MMSC will use the most current recommendations to improve the diagnostic capacity of laboratories to isolate and identify these agents. Facilities should work with state and federal public health services to tailor diagnostic strategies to specific events. Currently the Bioterrorism Emergency Number at CDC is at the Emergency Response Office, NCEH, 770/488-7100.

1. **Obtaining diagnostic samples**
   See specific recommendations for diagnostic sampling for each agent. Sampling should be performed in accordance with Standard Precautions. In all cases of suspected bioterrorism, collect an acute phase serum sample to be analyzed, aliquotted, and saved for comparison to a later convalescent serum sample. If there is a suspected airborne transmission masks should be worn when collecting samples.

2. **Laboratory criteria for processing potential bioterrorism agents**
   Laboratory capacity determines one of four levels according to the ability to support diagnostics needs. The proposed Levels are:
   - **Level A:** Clinical laboratories – minimal identification of agents
   - **Level B:** County/ State/ other laboratories – identification, confirmation, susceptibility testing
   - **Level C:** State and other large facility laboratories with advanced capacity for testing – some molecular technologies
- Level D: CDC or select Department of Defense laboratories, such as U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) – Bio Safety Level (BSL) 3 and 4 labs with special surge capacity and advanced molecular typing techniques.

The MMSC lab is capable of providing Level A support.
- Level B will be sent to the State Hygienic Lab
- Level C will be sent to a Reference Lab
- Level D will be sent to or as directed by CDC

3. **Transport requirements**  
Specimen packaging & transport must be coordinated with local/state health departments & the FBI. A chain of custody document should accompany the specimen from the moment of collection. For specific instructions, contact the **Bioterrorism Emergency Number at the CDC Emergency Response Office, 770/488-7100**. Specimens shall be transported per the transport policies from MMSC Lab Policy & Procedure Manual.

F. **Patient, Visitor, and Public Information**
Clear, consistent, understandable information should be provided (e.g., via fact sheets) to patients, visitors, and the general public. Public Relations and Administration will disseminate this information. Visitors to the hospital may be limited for the protection of the patient, family and general public.

See diagram for lines of authority and flow of communication. IC professionals working with the IC committee and administration should coordinate in advance with state and local health agencies, local emergency services, and local broadcast media systems to decide how communication and action across agencies will be accomplished. Failure to provide a public forum for information exchange may increase anxiety and misunderstanding, increasing fear among individuals who attribute non-specific symptoms to exposure to the bioterrorism agent.

**Reported Suspect Case from the Emergency Department or other Medical Staff**

Infection Control and Public Health Should Be Notified Immediately
Section II: Agent-Specific Recommendations

A. Anthrax

1. Description of Agent / Syndrome
   a. Etiology
   Anthrax is an acute infectious disease caused by Bacillus anthracis, a spore forming, and gram-positive bacillus. Associated disease occurs most frequently in sheep, goats, and cattle, which acquire spores through ingestion of contaminated soil. Humans can become infected through skin contact, ingestion, or inhalation of B. anthracis spores from infected animals or animal products (as in “Woolsorter’s disease” from exposure to goat hair). Person-to-person transmission of inhalational disease does not occur. Direct exposure to vesicle secretions of cutaneous anthrax lesions may result in secondary cutaneous infection.¹

   b. Clinical features
   Human anthrax infection can occur in three forms: pulmonary, cutaneous, or gastrointestinal, depending on the route of exposure. Of these forms, pulmonary anthrax is associated with bioterrorism exposure to aerosolized spores.⁹ Clinical features for each form of anthrax include:
   
   **Pulmonary**
   - Non-specific prodrome of flu-like symptoms follows inhalation of infectious spores.
   - Possible brief interim improvement.
   - Two to four days after initial symptoms, abrupt onset of respiratory failure and hemodynamic collapse, possibly accompanied by thoracic edema and a widened mediastinum on chest radiograph suggestive of mediastinal lymphadenopathy and hemorrhagic mediastinitis.
   - Gram-positive bacilli on blood culture, usually after the first two or three days of illness.
   - Treatable in early prodromal stage. Mortality remains extremely high despite antibiotic treatment if it is initiated after onset of respiratory symptoms.

   **Cutaneous**
   - Local skin involvement after direct contact with spores or bacilli.
   - Commonly seen on the head, forearms or hands.
   - Localized itching followed by a papular lesion that turns vesicular and within 2-6 days develops into a depressed black eschar.
   - Usually non-fatal if treated with antibiotics.

   **Gastro-intestinal**
   - Abdominal pain, nausea, vomiting, and fever following ingestion of contaminated food, usually meat.
   - Bloody diarrhea, hematemesis.
   - Gram-positive bacilli on blood culture, usually after the first two or three days of illness.
   - Usually fatal after progression to toxemia and sepsis.¹⁰

   c. Modes of transmission
   The spore form of B. anthracis is durable. As a bioterrorism agent, it could be delivered as an aerosol. The modes of transmission for anthrax include:
   - Inhalation of spores.
   - Cutaneous contact with spores or spore-contaminated materials.
   - Ingestion of contaminated food.¹

   d. Incubation period
   The incubation period following exposure to B. anthracis ranges from 1 day to 8 weeks (average 5 days), depending on the exposure route and dose:
   - 2-60 days following pulmonary exposure.
   - 1-7 days following cutaneous exposure.
   - 1-7 days following ingestion.
2. Preventive Measures
   a. Vaccine availability
      - Inactivated, cell-free anthrax vaccine (Bioport Corporation 517/327-1500, formerly Michigan Biologic Products Institute*) – limited availability.

   b. Immunization recommendations
      - Routinely administered to military personnel. Routine vaccination of civilian populations not recommended.1,10-12

3. Infection Control Practices for Patient Management
   Symptomatic patients with suspected or confirmed infections with B. anthracis should be managed according to current guidelines specific to their disease state. Recommendations for chemotherapy are beyond the scope of this document. For up-to-date information and recommendations for therapy, contact the local and state health department and the Bioterrorism Emergency Number at the CDC Emergency Response Office, 770/488-7100.
   a. Isolation precautions
      - Standard Precautions are used for the care of patients with infections associated with B. anthracis. Standard Precautions include the routine use of gloves for contact with non-intact skin, including rashes and skin lesions.
   b. Patient placement
      - Private room placement for patients with anthrax is not necessary. Airborne transmission of anthrax does not occur. Skin lesions may be infectious, but requires direct skin contact only.
   c. Patient transport
      - Standard Precautions should be used for transport and movement of patients with B. anthracis infections.
   d. Cleaning, disinfecting, and sterilization of equipment and environment
      - Principles of Standard Precautions should be generally applied for the management of patient-care equipment and for environmental control (see Section I for more detail).
   e. Discharge management
      - No special discharge instructions are indicated. Home care providers should be taught to use Standard Precautions for all patient care (e.g., dressing changes).
   f. Post-mortem care
      - Standard Precautions should be used for post-mortem care. Standard Precautions include wearing appropriate personal protective equipment, including masks and eye protection, when generation of aerosols or splatter of body fluids is anticipated.5

4. Post Exposure Management
   a. Decontamination of patients / environment
      - The risk for re-aerosolization of B. anthracis spores appears to be extremely low in settings where spores were released intentionally or were present at low or high levels. In situations where the threat of gross exposure to B. anthracis spores exists, cleansing of skin and potentially contaminated fomites (e.g. clothing or environmental surfaces) may be considered to reduce the risk for cutaneous and gastrointestinal forms of disease. The plan for decontaminating patients exposed to anthrax may include the following:
         - Instructing patients to remove contaminated clothing and store in labeled, plastic bags.
         - Handling clothing minimally to avoid agitation.
         - Instructing patients to shower thoroughly with soap and water (and providing assistance if necessary).

*Use of trade names and commercial sources is for identification only and does not constitute endorsement by CDC or the U.S. Department of Health and Human Services
• Instructing personnel regarding Standard Precautions and wearing appropriate barriers (e.g. gloves, gown, and respiratory protection) when handling contaminated clothing or other contaminated fomites.
• Decontaminating environmental surfaces using an EPA-registered, facility-approved sporicidal/germicidal agent or 0.5% hypochlorite solution (one part household bleach added to nine parts water).²,⁶

b. Prophylaxis and post-exposure immunization

Recommendations for prophylaxis are subject to change. Up-to-date recommendations should be obtained in consultation with local and state health departments and CDC.

Prophylaxis should be initiated upon confirmation of an anthrax exposure (Table 1).

Table 1. Recommended post-exposure prophylaxis for exposure to Bacillus anthracis

<table>
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<tr>
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<tr>
<td>Oral Fluoroquinolones</td>
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<td>One of the following:</td>
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<td>Ciprofloxacin</td>
<td>500 mg twice daily</td>
<td>20-30 mg per kg of body mass daily, divided into two doses</td>
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<tr>
<td>Levofloxacin</td>
<td>500 mg once daily</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Ofloxacin</td>
<td>400 mg twice daily</td>
<td>Not recommended</td>
</tr>
<tr>
<td>If Fluoroquinolones are not available or are contraindicated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doxycycline</td>
<td>100 mg twice daily</td>
<td>5 mg per kg of body mass per day divided every 8 hours (not to exceed 500mg, three times daily)</td>
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</table>

§ Pediatric use of Fluoroquinolones and Tetracyclines is associated with adverse effects that must be weighed against the risk of developing a lethal disease. If B. anthracis exposure is confirmed, the organism must be tested for penicillin susceptibility. If susceptible, exposed children may be treated with oral Amoxicillin 40mg per kg of body mass per day divided every 8 hours (not to exceed 500mg, three times daily).

Prophylaxis should continue until B. anthracis exposure has been excluded. If exposure is confirmed, prophylaxis should continue for 8 weeks. In addition to prophylaxis, post-exposure immunization with an inactivated, cell-free anthrax vaccine is also indicated following anthrax exposure. If available, post-exposure vaccination consists of three doses of vaccine at 0, 2 and 4 weeks after exposure. With vaccination, post-exposure antimicrobial prophylaxis can be reduced to 4 weeks.¹

c. Triage and management of large scale exposures / potential exposures

Advance planning should include identification of:
• Sources of prophylactic antibiotics and planning for acquisition on short notice.
• Locations, personnel needs and protocols for administering prophylactic post-exposure care to large numbers of potentially exposed individuals.
• Means for providing telephone follow-up information and other public communications services.

Intensive care unit managers will need to consider in advance:
• How limited numbers of ventilators will be distributed in the event of a large number of patients arriving with abrupt pulmonary decompensation.
• How additional ventilators can be obtained.
• In the event of severely limited ventilator availability, whether and when ventilator support will be discontinued for a terminally ill individual.³,⁵,¹¹
See Section I for additional general details regarding planning for large-scale patient management.

5. **Laboratory Support and Confirmation**
   Diagnosis of anthrax is confirmed by aerobic culture performed in a BSL -2 laboratory.¹
   a. Diagnostic samples to obtain include:
      - Blood cultures.
      - Acute serum for frozen storage.
      - Stool culture if gastrointestinal disease is suspected.
   b. Laboratory selection
      Handling of clinical specimens should be coordinated with local and state health departments, and undertaken in BSL -2 or -3 laboratories. The FBI will coordinate collection of evidence and delivery of forensic specimens to FBI or Department of Defense laboratories.
   c. Transport requirements
      Specimen packaging and transport must be coordinated with local and state health departments, and the FBI. A chain of custody document should accompany the specimen from the moment of collection. For specific instructions, contact the Bioterrorism Emergency Number at the CDC Emergency Response Office, 770/488-7100. Advance planning may include identification of appropriate packaging materials and transport media in collaboration with the clinical laboratory at individual facilities.

6. **Patient, Visitor, and Public Information**
   Fact sheets for distribution should be prepared, including explanation that people recently exposed to *B. anthracis* are not contagious, and antibiotics are available for prophylactic therapy along with the anthrax vaccine. Dosing information and potential side effects should be explained clearly. Decontamination procedures, i.e., showering thoroughly with soap and water; and environmental cleaning, i.e., with 0.5% hypochlorite solution (one part household bleach added to nine parts water), can be described.

B. **Botulism**

1. **Description of Agent / Syndrome**
   a. Etiology
      *Clostridium botulinum* is an anaerobic gram-positive bacillus that produces a potent neurotoxin, botulinum toxin. In humans, botulinum toxin inhibits the release of acetylcholine, resulting in characteristic flaccid paralysis. *C. botulinum* produces spores that are present in soil and marine sediment throughout the world. Food borne botulism is the most common form of disease in adults. An inhalation form of botulism is also possible¹³. Botulinum toxin exposure may occur in both forms as agents of bioterrorism.
   
   b. Clinical features
      Food borne botulism is accompanied by gastrointestinal symptoms. Inhalation botulism and food borne botulism are likely to share other symptoms including:
      - Responsive patient with absence of fever.
      - Symmetric cranial neuropathies (drooping eyelids, weakened jaw clench, difficulty swallowing or speaking).
      - Blurred vision and diploma due to extra-ocular muscle palsies.
      - Symmetric descending weakness in a proximal to distal pattern (paralysis of arms first, followed by respiratory muscles, then legs).
      - Respiratory dysfunction from respiratory muscle paralysis or upper airway obstruction due to weakened glottis.
      - No sensory deficits.

   c. Mode of transmission
      Botulinum toxin is generally transmitted by ingestion of toxin-contaminated food⁶. Aerosolization of botulinum toxin has been described and may be a mechanism for bioterrorism exposure ¹³.
d. Incubation period
   - Neurologic symptoms of food borne botulism begin 12 – 36 hours after ingestion.
   - Neurologic symptoms of inhalation botulism begin 24- 72 hours after aerosol exposure.

e. Period of communicability
   Botulism is not transmitted from person to person.\(^\text{10}\)

2. Preventive Measures
   a. Vaccine availability
      A pentavalent toxoid vaccine has been developed by the Department of Defense. This vaccine is available as an investigational new drug (contact USAMRIID, 301/619-2833). Completion of a recommended schedule (0, 2, 12 weeks) has been shown to induce protective antitoxin levels detectable at 1-year post vaccination.
   b. Immunization recommendations
      Routine immunization of the public, including healthcare workers, is not recommended.\(^\text{11}\)

3. Infection Control Practices for Patient Management
   Symptomatic patients with suspected or confirmed botulism should be managed according to current guidelines.\(^\text{14}\) Recommendations for therapy are beyond the scope of this document. For up-to-date information and recommendations for therapy, contact CDC or state health department.
   a. Isolation precautions
      Standard Precautions are used for the care of patients with botulism.
   b. Patient placement
      Patient-to-patient transmission of botulism does not occur. Patient room selection and care should be consistent with facility policy.
   c. Patient transport
      Standard Precautions should be used for transport and movement of patients with botulism.
   d. Cleaning, disinfecting, and sterilization of equipment and environment
      Principles of Standard Precautions should be generally applied to the management of patient-care equipment and environmental control (see Section I for more detail).
   e. Discharge management
      No special discharge instructions are indicated.
   f. Post-mortem care
      Standard Precautions should be used for post-mortem care.\(^\text{5}\)

4. Post Exposure Management
   Suspicion of even single cases of botulism should immediately raise concerns of an outbreak potentially associated with shared contaminated food. In collaboration with CDC and local /state health departments, attempts should be made to locate the contaminated food source and identify other persons who may have been exposed.\(^\text{13}\) Any individuals suspected to have been exposed to botulinum toxin should be carefully monitored for evidence of respiratory compromise.\(^\text{14}\)
   a. Prophylaxis and post-exposure immunization
      Trivalent botulinum antitoxin is available by contacting state health departments or by contacting CDC (404/639-2206 during office hours, 404/639-2888 after hours). This horse serum product has a <9% percent rate of hypersensitivity reactions. Skin testing should be performed according to the package insert prior to administration.\(^\text{14}\)
   b. Triage and management of large scale exposures / potential exposures
      Patients affected by botulinum toxin are at risk for respiratory dysfunction that may necessitate mechanical ventilation. Ventilator support is required, on average, for 2 to 3 months before neuromuscular recovery allows unassisted breathing. Large-scale exposures to botulinum toxin may overwhelm an institution’s available resources for mechanical ventilation. Sources of auxiliary support and means to transport patients to auxiliary sites, if necessary should be planned in advance with coordination among neighboring facilities.\(^\text{6,10}\)
See Section I for additional general details regarding planning for large-scale patient management.

5. Laboratory Support and Confirmation
   a. Obtaining diagnostic samples
      Routine laboratory tests are of limited value in the diagnosis of botulism. Detection of toxin is possible from serum, stool samples, or gastric secretions. For advice regarding the appropriate diagnostic specimens to obtain, contact state health authorities or CDC (Food borne and Diarrheal Diseases Branch, 404/639-2888).
   b. Laboratory selection
      Handling of clinical specimens should be coordinated with local and state health departments. The FBI will coordinate collection of evidence and delivery of forensic specimens to FBI or Department of Defense laboratories.
   c. Transport requirements
      Specimen packaging and transport must be coordinated with local and state health departments, and the FBI. A chain of custody document should accompany the specimen from the moment of collection. For specific instructions, contact the Bioterrorism Emergency Number at the CDC Emergency Response Office, 770/488-7100. Advance planning may include identification of appropriate packaging materials and transport media in collaboration with the clinical laboratory at individual facilities.

6. Patient, Visitor, and Public Information
   Fact sheets for distribution should be prepared, including explanation that people exposed to botulism toxin are not contagious. A clear description of symptoms including blurred vision, drooping eyelids, and shortness of breath should be provided with instructions to report for evaluation and care if such symptoms develop.

C. Plague

1. Description of Agent / Syndrome
   a. Etiology
      Plague is an acute bacterial disease caused by the gram-negative bacillus *Yersinia pestis*, which is usually transmitted by infected fleas, resulting in lymphatic and blood infections (bubonic and septicemia plague). A bioterrorism-related outbreak may be expected to be airborne, causing a pulmonary variant, pneumonic plague.\(^3,10\)
   b. Clinical features of pneumonic plague include:
      - Fever, cough, chest pain.
      - Hemothysis.
      - Muco-purulent or watery sputum with gram-negative rods on gram stain.
      - Radiographic evidence of bronchopneumonia.\(^10\)
   c. Modes of transmission
      - Plague is normally transmitted from an infected rodent to man by infected fleas.
      - Bioterrorism-related outbreaks are likely to be transmitted through dispersion of an aerosol.
      - Person-to-person transmission of pneumonic plague is possible via large aerosol droplets.\(^6\)
   d. Incubation period
      The incubation period for plague is normally 2 – 8 days if due to flea borne transmission. The incubation period may be shorter for pulmonary exposure (1-3 days).\(^10\)
   e. Period of communicability
      Patients with pneumonic plague may have coughs productive of infectious particle droplets. Droplet precautions, including the use of a mask for patient care, should be implemented until the patient has completed 72 hours of antimicrobial therapy.\(^3,6\)

2. Preventive Measures
   a. Vaccine availability
      Formalin-killed vaccine exists for bubonic plague, but has not been proven to be effective for pneumonic plague. It is not currently available in the United States.
b. Immunization recommendations
   Routine vaccination requires multiple doses given over several weeks and is not recommended for the general population. Post-exposure immunization has no utility.

3. Infection Control Practices for Patient Management
   Symptomatic patients with suspected or confirmed plague should be managed according to current guidelines. Recommendations for specific therapy are beyond the scope of this document. For up-to-date information and recommendations for therapy, contact CDC or state health department.
   a. Isolation precautions
      For pneumonic plague, Droplet Precautions should be used in addition to Standard Precautions.
      - Droplet Precautions are used for patients known or suspected to be infected with microorganisms transmitted by large particle droplets, generally larger than 5μ in size, that can be generated by the infected patient during coughing, sneezing, talking, or during respiratory-care procedures.
      - Droplet Precautions require healthcare providers and others to wear a surgical-type mask when within 3 feet of the infected patient. Based on local policy, some healthcare facilities require a mask be worn to enter the room of a patient on Droplet Precautions.
      - Droplet Precautions should be maintained until patient has completed 72 hours of antimicrobial therapy.
   b. Patient placement
      Patients suspected or confirmed to have pneumonic plague require Droplet Precautions. Patient placement recommendations for Droplet Precautions include:
      - Placing infected patient in a private room.
      - Cohort in symptomatic patients with similar symptoms and the same presumptive diagnosis (i.e. pneumonic plague) when private rooms are not available.
      - Maintaining spatial separation of at least 3 feet between infected patients and others when cohorting is not achievable.
      - Avoiding placement of patient requiring Droplet Precautions in the same room with an immunocompromised patient.
      - Special air handling is not necessary and doors may remain open.
   c. Patient transport
      - Limit the movement and transport of patients on Droplet Precautions to essential medical purposes only.
      - Minimize dispersal of droplets by placing a surgical-type mask on the patient when transport is necessary.
   d. Cleaning, disinfecting, and sterilization of equipment and environment
      Principles of Standard Precautions should be generally applied to the management of patient-care equipment and for environmental control (see Section I for more detail).
   e. Discharge management
      Generally, patients with pneumonic plague would not be discharged from a healthcare facility until no longer infectious (completion of 72 hours of antimicrobial therapy) and would require no special discharge instructions. In the event of a large bioterrorism exposure with patients receiving care in their homes, home care providers should be taught to use Standard and Droplet Precautions for all patient care.
   f. Post-mortem care
      Standard Precautions and Droplet Precautions should be used for post-mortem care.

4. Post Exposure Management
   a. Decontamination of patients / environment
      The risk for re-aerosolization of Y. pestis from the contaminated clothing of exposed persons is low. In situations where there may have been gross exposure to Y. pestis, decontamination of skin and potentially contaminated fomites (e.g. clothing or environmental surfaces) may be considered to reduce the risk for cutaneous or bubonic forms of the disease.
      The plan for decontaminating patients may include:
      - Instructing patients to remove contaminated clothing and storing in labeled, plastic bags.
      - Handling clothing minimally to avoid agitation.
• Instructing to patients to shower thoroughly with soap and water (and providing assistance if necessary).
• Instructing personnel regarding Standard Precautions and wearing appropriate barriers (e.g. gloves, gown, face shield) when handling contaminated clothing or other contaminated fomites.
• Performing environmental surface decontamination using an EPA-registered, facility-approved sporicidal/germicidal agent or 0.5% hypochlorite solution (one part household bleach added to nine parts water).2,5

b. Prophylaxis
Recommendations for prophylaxis are subject to change. Up-to-date recommendations should be obtained in consultation with local and state health departments and CDC.

Post-exposure prophylaxis should be initiated following confirmed or suspected bioterrorism Y. pestis exposure, and for post-exposure management of healthcare workers and others who had unprotected face-to-face contact with symptomatic patients (Table 2).

Table 2. Recommended post-exposure prophylaxis for exposure to Yersinia pestis.

<table>
<thead>
<tr>
<th>Antimicrobial agent</th>
<th>Adults</th>
<th>Children §</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First choice</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doxycycline</td>
<td>100 mg twice daily</td>
<td>5 mg per kg of body mass per day divided into two doses</td>
</tr>
<tr>
<td><strong>2nd choice</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>500 mg twice daily</td>
<td>20-30 mg per kg of body mass daily, divided into two doses</td>
</tr>
</tbody>
</table>

§ Pediatric use of Tetracycline and Fluoroquinolones is associated with adverse effects that must be weighed against the risk of developing a lethal disease.

Prophylaxis should continue for 7 days after last known or suspected Y. pestis exposure, or until exposure has been excluded.10

Facilities should ensure that policies are in place to identify and manage healthcare workers exposed to infectious patients. In general, maintenance of accurate occupational health records will facilitate identification, contact, assessment, and delivery of post-exposure care to potentially exposed healthcare workers.3,11,12

c. Triage and management of large scale exposures / potential exposures
Advance planning should include identification of sources for appropriate masks to facilitate adherence to Droplet Precautions for potentially large numbers of patients and staff. Instruction and reiteration of requirements for Droplet Precautions (as opposed to Airborne Precautions) will be necessary to promote compliance and minimize fear and panic related to an aerosol exposure.

Advance planning should also include identification of:
• Sources of bulk prophylactic antibiotics and planning for acquisition on short notice.
• Locations, personnel needs and protocols for administering prophylactic post-exposure care to large numbers of potentially exposed individuals.
• Means for providing telephone follow-up information and other public communications services.

See Section I for additional general details regarding planning for large-scale patient management.
5. **Laboratory Support and Confirmation**

Laboratory confirmation of plague is by standard microbiologic culture, but slow growth and misidentification in automated systems are likely to delay diagnosis. For decisions regarding obtaining and processing diagnostic specimens, contact state laboratory authorities or CDC.

a. Diagnostic samples to obtain include:
   - Serum for capsular antigen testing.
   - Blood cultures.
   - Sputum or tracheal aspirates for Gram’s, Wayson’s, and fluorescent antibody staining.
   - Sputum or tracheal aspirates for culture.

b. Laboratory selection

Handling of clinical specimens should be coordinated with local and state health departments, and undertaken in Bio-Safety Level (BSL) -2 or -3 laboratories. The FBI will coordinate collection of evidence and delivery of forensic specimens to FBI or Department of Defense laboratories.

c. Transport requirements

Specimen packaging and transport must be coordinated with local and state health departments, and the FBI. A chain of custody document should accompany the specimen from the moment of collection. For specific instructions, contact the Bioterrorism Emergency Number at the CDC Emergency Response Office, 770/488-7100. Advance planning may include identification of appropriate packaging materials and transport media in collaboration with the clinical laboratory at individual facilities.

6. **Patient, Visitor, and Public Information**

Fact sheets for distribution should be prepared, including a clear description of Droplet Precautions, symptoms of plague, and instructions to report for evaluation and care if such symptoms are recognized. The difference between prophylactic antimicrobial therapy and treatment of an actual infection should be clarified. Decontamination by showering thoroughly with soap and water can be recommended.

D. **Smallpox**

1. **Description of Agent / Syndrome**

a. Etiology

Smallpox is an acute viral illness caused by the variola virus. Smallpox is a bioterrorism threat due to its potential to cause severe morbidity in a non-immune population and because it can be transmitted via the airborne route. A single case is considered a public health emergency.

b. Clinical features

Acute clinical symptoms of smallpox resemble other acute viral illnesses, such as influenza. Skin lesions appear, quickly progressing from macules to papules to vesicles. Other clinical symptoms to aid in identification of smallpox include:

d. 2-4 day, non-specific prodrome of fever, myalgias.

e. Rash most prominent on face and extremities (including palms and soles) in contrast to the truncal distribution of varicella.

f. Rash scabs over in 1-2 weeks.

g. In contrast to the rash of varicella, which arises in “crops,” variola rash has a synchronous onset.

c. Mode of transmission

Smallpox is transmitted via both large and small respiratory droplets. Patient-to-patient transmission is likely from airborne and droplet exposure, and by contact with skin lesions or secretions. Patients are considered more infectious if coughing or if they have a hemorrhagic form of smallpox.

d. Incubation period

The incubation period for smallpox is 7-17 days; the average is 12 days.

e. Period of communicability

Unlike varicella, which is contagious before the rash is apparent, patients with smallpox become infectious at the onset of the rash and remain infectious until their scabs separate (approximately 3 weeks).
2. **Preventive Measures**
   a. **Vaccine availability**
      A live-virus intradermal vaccination is available for the prevention of smallpox.\textsuperscript{12}
   b. **Immunization recommendations**
      Since the last naturally acquired case of smallpox in the world occurred more than 20 years ago, routine public vaccination has not been recommended.\textsuperscript{3}

      **Vaccination against smallpox does not reliably confer lifelong immunity. Even previously vaccinated persons should be considered susceptible to smallpox.**

3. **Infection Control Practices for Patient Management**
   Symptomatic patients with suspected or confirmed smallpox should be managed according to current guidelines. Recommendations for specific therapy are beyond the scope of this document. For up-to-date information and recommendations for therapy, contact the CDC or state health department.
   
   a. **Isolation precautions**
      For patients with suspected or confirmed smallpox, both Airborne and Contact Precautions should be used in addition to Standard Precautions.
      1. **Airborne Precautions** are used for patients known or suspected to be infected with microorganisms transmitted by airborne droplet nuclei (small particle residue, 5μ or smaller in size) of evaporated droplets containing microorganisms that can remain suspended in air and can be widely dispersed by air currents.
      2. **Airborne Precautions** require healthcare providers and others to wear respiratory protection when entering the patient room. (Appropriate respiratory protection is based on facility selection policy; must meet the minimal NIOSH standard for particulate respirators, N95).\textsuperscript{5,15}
      3. **Contact Precautions** are used for patients known or suspected to be infected or colonized with epidemiological important organisms that can be transmitted by direct contact with the patient or indirect contact with potentially contaminated surfaces in the patient’s care area.
      4. **Contact precautions** require healthcare providers and others to:
         - Wear clean gloves upon entry into patient room.
         - Wear gown for all patient contact and for all contact with the patient’s environment. Based on local policy, some healthcare facilities require a gown be worn to enter the room of a patient on Contact Precautions. Gown must be removed before leaving the patient’s room.
         - Wash hands using an antimicrobial agent.
   
   b. **Patient placement**
      Patients suspected or confirmed with smallpox require placement in rooms that meet the ventilation and engineering requirements for Airborne Precautions, which include:
      1. Monitored negative air pressure in relation to the corridor and surrounding areas.
      2. Maintain 6 – 12 air exchanges per hour.
      3. Appropriate discharge of air to the outdoors, or monitored high efficiency filtration of air prior to circulation to other areas in the healthcare facility.
      4. A door that must remain closed.

      **Healthcare facilities without patient rooms appropriate for the isolation and care required for Airborne Precautions should have a plan for transfer of suspected or confirmed smallpox patients to neighboring facilities with appropriate isolation rooms.**

      Patient placement in a private room is preferred. However, in the event of a large outbreak, patients who have active infections with the same disease (i.e., smallpox) may be cohorted in rooms that meet appropriate ventilation and airflow requirements for Airborne Precautions.\textsuperscript{5,6}
   
   c. **Patient transport**
      - Limit the movement and transport of patients with suspected or confirmed smallpox to essential medical purposes only.
      - When transport is necessary, minimize the dispersal of respiratory droplets by placing a mask on the patient, if possible\textsuperscript{5}
d. Cleaning, disinfecting, and sterilization of equipment and environment
   A component of Contact Precautions is careful management of potentially contaminated equipment and environmental surfaces.
   - When possible, non-critical patient care equipment should be dedicated to a single patient (or cohort of patients with the same illness).
   - If use of common items is unavoidable, all potentially contaminated, reusable equipment should not be used for the care of another patient until it has been appropriately cleaned and reprocessed. Policies should be in place and monitored for compliance.  

3. Discharge management
   In general, patients with smallpox will not be discharged from a healthcare facility until determined they are no longer infectious. Therefore, no special discharge instructions are required.

f. Post-mortem care
   Airborne and Contact Precautions should be used for post-mortem care.  

5. Post Exposure Management
   a. Decontamination of patients / environment
      - Patient decontamination after exposure to smallpox is not indicated.
      - Items potentially contaminated by infectious lesions should be handled using Contact Precautions.

b. Prophylaxis and post-exposure immunization
   Recommendations for prophylaxis are subject to change. Up-to-date recommendations should be obtained in consultation with local and state health departments and CDC.

Post-exposure immunization with smallpox vaccine (vaccinia virus) is available and effective. Vaccination alone is recommended if given within 3 days of exposure. Passive immunization is also available in the form of vaccinia immune-globulin (VIG) (0.6ml/kg IM). If greater than 3 days has elapsed since exposure, both vaccination and VIG are recommended. VIG is maintained at USAMRIID, 301/619-2833. Vaccination is generally contraindicated in pregnant women, and persons with immunosuppression, HIV–infection, and eczema, which are at risk for disseminated vaccinia disease. However, the risk of smallpox vaccination should be weighed against the likelihood for developing smallpox following a known exposure. VIG should be given concomitantly with vaccination in these patients.

Following prophylactic care, exposed individuals should be instructed to monitor themselves for development of flu-like symptoms or rash during the incubation period (i.e., for 7 to 17 days after exposure) and immediately report to designated care sites selected to minimize the risk of exposure to others.

Facilities should ensure that policies are in place to identify and manage health care workers exposed to infectious patients. In general, maintenance of accurate occupational health records will facilitate identification, contact, assessment, and delivery of post-exposure care to potentially exposed healthcare workers.

c. Triage and management of large scale exposures / potential exposures
   Advance planning must involve IC professionals in cooperation with building engineering staff, to identify sites within the facility that can provide necessary parameters for Airborne Precautions. See Section I for additional general details regarding planning for large-scale patient management.

6. Laboratory Support and Confirmation
   a. Diagnostic samples to obtain
      For decisions regarding obtaining and processing diagnostic specimens, contact state laboratory authorities or CDC.

b. Laboratory selection
   Handling of clinical specimens must be coordinated with state health departments, CDC, and USAMRIID. Testing can be performed only in BSL - 4 laboratories. The FBI will coordinate
collection of evidence and delivery of forensic specimens to FBI or Department of Defense laboratories.

c. Transport requirements
   Specimen packaging and transport must be coordinated with local and state health departments, and the FBI. A chain of custody document should accompany the specimen from the moment of collection. For specific instructions, contact the Bioterrorism Emergency Number at the CDC Emergency Response Office, 770/488-7100. Advance planning may include identification of appropriate packaging materials and transport media in collaboration with the clinical laboratory at individual facilities.

7. Patient, Visitor, and Public Information
   Fact sheets for distribution should be prepared, including a clear description of symptoms and where to report for evaluation and care if such symptoms are recognized. Details about the type and duration of isolation should be provided. Vaccination information that details who should receive the vaccine and possible side effects should be provided. Extreme measures such as burning or boiling potentially exposed materials should be discouraged.
Reference List


Appendix 3: Websites Relevant to Bioterrorism Readiness

http://www.apic.org
http://www.cdc.gov/ncidod/diseases/antherr.htm
http://www.cdc.gov/ncidod/dbmd/anthrax.htm
http://www.cdc.gov/ncidod/diseases/foodborn/botu.htm
http://www.cdc.gov/ncidod/srp/drugservice/immuodrugs.htm
http://www.abc-med.org/SiteContent/HomePage/WhatsNew/anthraxinfo/Anthraxinfo3.htm
http://www.defenselink.mil/specials/Anthrax/anth.htm
http://www.hopkins-id.edu/bioterr/bioterr_1.html
http://www.who.int/emc-documents/zoonoses/docs/whoemczdi986.html
http://www.hopkins-biodefense.org

Appendix 4: Other sources of information:

USAMRIID 301/619-2833
BIOPORT (producers of anthrax vaccine) 517/327-1500
AMERICAN RED CROSS 641/753-5354
SALVATION ARMY 1-888/321-3433
US PUBLIC HEALTH SERVICE 1-800-872-6367
DOMESTIC PREPAREDNESS INFORMATION LINE 1-800-368-6498
NATIONAL RESPONSE CENTER 1-800-424-8802

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(The views expressed in this article by authors Judith F. English and John D. Malone, employed by the Department of the Navy, do not reflect the official policy or position of the Department of the Navy, or the Department of Defense, or the U.S. Government.)
Nuclear Weapons of Mass Destruction

A nuclear incident is an event in which a nuclear agent is used as a weapon of terrorism. It can involve the detonation (or threatened detonation) of a nuclear bomb or the detonation (or threatened detonation) of an explosive device that includes nuclear materials. Nuclear agents are the least likely weapon of mass destruction to be used by terrorists because of the difficulty of acquiring, building and using nuclear weapons. However terrorists could cause a nuclear incident by detonating an explosive device (like a truck bomb) near a nuclear power plant or attacking nuclear cargo during transport. Food or other products could be contaminated with radioactive materials.

Types of Nuclear Devices:
1. Simple radiological device – spreading radioactive material without the use of an explosive device, such as placement of a high activity radioactive isotope in a public place exposing numerous individuals to various levels of radiation.
2. Radiological dispersal device – combination of an explosive agent with radioactive materials. The initial explosion kills or injures those closest to the bomb, while the radioactive substances remain to expose and contaminate survivors and emergency responders.
4. Improvised nuclear device – designed to cause a nuclear detonation. Construction of such a device to produce a nuclear detonation would be difficult, as it is not easy to get the weapon to detonate correctly.
5. Nuclear Weapon – such as an “Atomic bomb”. The consequences of a one-kiloton yield bomb within one minute would be:
   - Blast range would reach a distance of approx. 400 yards.
   - Thermal radiation would reach the same distance as the blast.
   - Nuclear radiation (i.e., gamma and neutron) would reach approx. half a mile.
   - The radioactive fallout could produce very high exposure rates, up to half a mile.
   - The added factor of electromagnetic pulse, which only applies to high aerial bursts (several kilometers) would result in damage to electric equipment.

Types of Radiation:
1. Alpha particles – larger particles
   A. Travel distance in the air: 1-2 inches
   B. Shielding required: Sheet of paper, unbroken skin, clothing
   C. Primary hazard: Inhalation, ingestion and introduction into the body via wound or injured skin.
   D. Personal protective equipment:
      I. Particulate protection for respiratory exposure
      II. Contamination control procedures to prevent ingestion
      III. Dermal protection to keep substances from the skin and protect damaged skin
2. Beta particles – smaller particles
   A. Travel distance in the air: Up to 10 feet
   B. Shielding required: Thick clothing including most PPE, some plastics, glass and some metals.
   C. Primary hazard: Inhalation, ingestion and introduction into the body via wound or injured skin.
   D. Personal protective equipment:
      I. Particulate protection for respiratory exposure
      II. Contamination control procedures to prevent ingestion
      III. Sufficient dermal protection to keep beta particles from reaching the skin and protect damaged skin
3. Gamma rays
   A. Travel distance in the air: Hundreds of feet
   B. Shielding required: Dense materials (lead, cement, soil)
   C. Primary hazard: Ability to penetrate deep into the body
   D. Personal protective equipment: None recommended
4. Neutrons
   A. Travel distance in the air: Hundreds of feet
   B. Shielding required: Special shielding required. Some plastics and some substances containing hydrogen such as water and paraffin.
   C. Primary hazard: Ability to penetrate deep into the body. Can make substances they strike radioactive.
   D. Personal protective equipment: None recommended

Radiation Protection Principles:
1. Time – the shorter the time in a radiation field, the less the radiation exposure. Work quickly and efficiently. A rotating team approach can be used to keep individual radiation exposures to a minimum.
2. Distance – the farther a person is from a source of radiation, the lower the radiation dose.
3. Shielding – shielding offered by barriers can reduce radiation exposure.
4. Quantity – limit the amount of radioactive material in the working area to decrease exposure.

Types of Radiation Injury:
1. External Irradiation – occurs when all or part of the body is exposed to penetrating radiation from an external source. A similar thing occurs during an ordinary chest x-ray. Following external exposure, an individual is not radioactive and can be treated like any other patient.
2. Contamination – radioactive materials in the form of gases, liquids, or solids are released into the environment and contaminate people externally, internally, or both. An external surface of the body, such as the skin, can become contaminated, and if radioactive materials get inside the body through the lungs, gut, or wounds, the contaminant can become deposited internally.
3. Incorporation – refers to the uptake of radioactive materials by body cells, tissues, and target organs such as bone, liver, thyroid, or kidney. Incorporation cannot occur unless contamination has occurred. All body substances, such as urine, feces or vomit must be considered contaminated. Contact the Radiation Safety Officer for instructions on proper disposal of these substances.

Routine procedures for radioactive substance decontamination should always include coordination with the:
- Department of Energy
- Department of Defense
- Health Department
- Emergency Management
- Other professionals trained in radiation response and detection.

Exposure management and monitoring is critical in order to provide maximum protection for the public and response personnel.

Order of Management and Treatment of Radiological Casualties:
1. Treat and stabilize life-threatening injuries
2. Prevent/minimize internal contamination
3. Assess external contamination and decontamination
4. Contain contamination to the treatment area
5. Minimize external contamination to medical personnel.
6. Assess internal contamination
7. Assess local radiation injuries/burns
8. Follow-up patients with significant whole-body irradiation or internal contamination
9. Counsel patient and family about potential long-term risks/effects.

Radioactive contamination, internal or external, is never immediately life threatening and therefore, treatment of significant medical conditions should always take precedence over radiological assessment or decontamination of the patient.

Patient decontamination:
1. Obtain all information from an emergency scene pertaining to radiation hazards.
2. Seek the guidance of and coordinate your efforts with a qualified Nuclear Medicine Professional/Radiation Safety Officer (Radiology), Hazardous Materials team or technical advisor to the Incident Commander.
3. Patient decontamination for radiological events will resemble protocols or procedures for other types of contamination events. The main difference is timing. Chemical decontamination is an emergency. Radiological decontamination is not.

4. Nonskid plastic sheeting can be placed as needed down the corridors where ambulance stretchers are wheeled to the ER. If injuries are not serious, the patient may be wrapped in clean sheets and transferred from the ambulance stretcher to a clean stretcher and then down the usual corridors with the contamination contained within the wrappings.

5. When possible, the patients should disrobe and shower themselves.

6. By using a double sheet, contaminated clothing can be cut off and removed by rolling the patient from one side to the other to free the clothing. Clothing is wrapped in the inner sheet and removed to a plastic bag. The outer sheet remains around the patient.

7. A Geiger counter easily monitors the effectiveness of decontamination procedures for beta- and/or gamma-emitting radionuclides.

8. For contamination not involving personal injury (e.g., no open wounds, cuts, etc.), the theory of decontamination is relatively simple. Most radioactive contamination on intact skin behaves like loose dirt and may be removed by routine washing.

9. Caregivers should avoid cross-contaminating victims by performing area wash-downs before assisting the next casualty and changing PPE as necessary.

10. Pre-wet victims clothing to reduce the chances of radioactive particles becoming airborne and respirable.

11. Removal of outer clothing and rapid washing of exposed skin and hair removes 95% of the contamination.

12. The skin barrier must be preserved, so procedures such as shaving or harsh scrubbing are not done. If hair needs to be removed, clipping is effective.

13. Cover the patient’s face with a mask if substances in their hair or on other parts of the face to prevent it from entering the eyes, nose or mouth.

14. Focus on eyes and open wounds:
   A. Clean wounds: Irrigate with copious amounts of normal saline. Deep debridement and excision only when particles or pieces of material are imbedded in tissues. Cover with waterproof dressing.
   B. Flush eyes gently with stream of normal saline directed away from the medial canthus so that material is not forced into the lacrimal duct.

15. Contaminated nares and ear canals should be gently irrigated with frequent suction to prevent forcing of materials into those cavities.

16. Avoid skin damage or abrasion-increased absorption:
   A. Heavy or obvious contamination near eyes, nose, moth and ears may be blotted first to remove or absorb it.
   B. Blotting or absorbing heavy contamination will allow you to avoid rinsing it over large areas of the body.

17. Wash with tepid water, gentle action, sponge and possibly mild soap.

**The externally exposed patient:**
In the absence of contamination, this patient can be admitted to any part of the ER without special precautions.

Local external exposures may result in skin manifestations. The doses required are large and usually result from brief radiation exposures.

Initial evidence of radiation damage is erythema that may be transient and the main phase occurs 14 to 24 days later. Skin effects are often called radiation burns.

In contrast to thermal and chemical burns, pain is not associated with initial erythema of radiation injury. Skin texture would initially be normal to sight and touch.

Hair distribution is usually normal in the first few days. Epilation does not occur before 10 to 20 days post exposure.
Consideration should be given to referring the patient to a radiation medicine specialist for follow-up care.

In significant total body external exposure, the GI tract and the bone marrow are the organs of concern.

Except for overwhelming exposures, the initial symptoms of the acute radiation syndrome (headache, malaise, anorexia, nausea and vomiting) usually don’t appear until hours post exposure.

In addition to a general physical, the physician should order white blood cell counts with differential and a platelet count every three hours until a good dose estimate can be obtained.

**The contaminated AND injured patient:**
This type of patient must be treated in an area where the patient can receive adequate medical care while the contamination is controlled. It must have a treatment area, a buffer zone, and an exit. The entire complex MUST be controlled. The flow of personnel, equipment, and supplies is in one direction, from the clean part of the hospital into the controlled area. NOTHING and NO ONE leaves this area until properly surveyed for contamination. This includes blood samples, X-rays, etc.

**Treatment:**
- The prevention and management of infection is the mainstay of therapy.
- Antibiotic prophylaxis should only be considered in afebrile patients at the highest risk for infection.
- Eventually leukemia or other cancers (lung, thyroid, and breast) appear.
- Blood transfusions and bone marrow transplants

**Incendiary Devices**

An incendiary device can be mechanical, electrical, or chemical and is used to start combustion and intentionally set fire to something else. These devices can be simple or complex, but usually consist of 3 basic parts:

1. A fuse or igniter
2. A container (glass, metal, plastic, or paper)
3. Incendiary material

Gasoline and rags may be used as accelerants to make the fire burn more quickly and at a higher temperature. Burns and smoke/toxic gas inhalation are common injuries secondary to incendiary devices.

**Chemical Weapons of Mass Destruction**

Chemical agents differ from biological agents in that these agents act within minutes and people exposed will develop symptoms right away. The primary route of exposure for chemical agents is inhalation. The toxicity of the agent depends largely on the size of the particles and/or water solubility of the gas. Large particles and highly water-soluble gases will be trapped in the nasopharynx, and small particles and gases with low solubility will enter more deeply into the lungs. Quick decontamination is essential, and antidotes are available for some chemical agents.

- Nerve agents
- Blister agents
- Blood agents
- Choking agents
- Riot control agents

**Nerve Agents:** Tabun, Sarin, Soman, VX
These liquids are the most toxic chemical agent and can cause death within minutes of exposure. Inhalation, ingestion, and dermal contact readily absorb nerve agents. They disable the enzymes responsible for the transmission of nerve impulses. Initial incapacitating effects occur within 1-10 minutes of exposure and death can occur within 15 minutes.
Persons whose skin or clothing is contaminated with a nerve agent can contaminate rescuers by direct contact or through off-gassing vapor. Persons whose skin is exposed only to nerve agent vapor pose no risk of secondary contamination, however clothing can trap vapor.

Symptoms: Similar to those of pesticides. Liquid on skin (within 30 minutes to 18 hours) Sweating and twitching at the site, nausea, vomiting, abdominal cramps, involuntary defecation and urination, pinpoint pupils, eye pain, headache, rhinorrhea, excessive salivation, lacrimation, chest tightness, bronchoconstriction, cough, shortness of breath, apnea, confusion, seizures, flaccid paralysis, coma and death.

Treatment: (See attached table of recommendations for Nerve Agent Therapy)
- Atropine – initial dose 2 mg. Additional doses until secretions and ventilation problems improve (will not reverse miosis).
- Pralidoxime Chloride – 1 gram IV over 20-30 minutes. May repeat 1 or 2 times at 60 – 90 minute intervals.
- Benzodiazepines – for seizure control or to prevent seizures in severely intoxicated patients.

**Vesicants (blister agents): Lewisite, Mustards, and phosgene oxime**
They are released as liquids or a vapor. They can cause blisters on skin and damage the eyes, mucous membranes, respiratory tract and internal organs.

Persons whose clothing or skin is contaminated can cause secondary contamination by direct contact or through off-gassing vapor. Persons exposed only to phosgene oxime vapor pose no risk of secondary contamination.

Symptoms - mustard: None for 2-24 hours. Mustard onion or garlic odor. Eye irritation, lids may swell and close, skin burning and itching, upper airway irritation, skin redness, sore throat, severely painful blisters on the skin and eyes. Bone marrow damage.

Symptoms – lewisite and phosgene oxime: Moderate to severe pain upon contact with skin or mucous membranes. Tissue grays. Severe skin, eye and airway damage. Conjunctivitis. Phosgene oxime is readily absorbed by the skin causing an immediate corrosive lesion. Ocular and pulmonary exposure may cause incapacitating inflammation.

Treatment:
- Topical antibiotics.
- Systemic analgesics.
- Fluid balance (do not overhydrate; not a thermal burn).
- Bronchodilators and steroids for pulmonary symptoms.
- BAL is the antidote for Lewisite.
- There is no antidote for phosgene oxime toxicity. Treatment consists of supportive measures.

**Blood agents: Hydrogen Cyanide, Cyanogen Chloride**
These gases are fast acting, highly poisonous chemicals. They cause seizures, respiratory failure and cardiac arrest through interference with absorption of oxygen into the bloodstream. Blood agents are highly volatile and enter the body through the act of breathing.

Symptoms: Anxiety, hyperventilation, respiratory distress, dizziness, nausea, weakness, loss of consciousness and convulsions. Cyanogen Chloride can cause immediate irritation to eyes, nose and airways.

Treatment: Cyanide Antidote Kit: Amyl nitrite ampule – first aid until IV established. Crush and place inside mask of BVM; 15 seconds of inhalation, then 15 second break. Repeat until IV established. Sodium nitrite – 300 mg over 2-4 minutes. Sodium thiosulfate – 12.5 g over 5 minutes.

**Pulmonary (choking) agents: Phosgene, Chlorine**
These gases have a corrosive effect on the respiratory system. Breathing these agents causes pulmonary edema where the lungs fill with fluid and choke the victim - also known as “dry land drowning”. Choking agents are heavy gases and tend to stay close to the ground but tend to dissipate rapidly in a breeze.

Treatment:
- Treat hypotension with fluid; no diuretics
- Ventilate with PEEP
- Bronchodilators

**Irritating agents: Riot control agents, CS, CN, Capsacin, Tear gas, Pepper spray, Mace**

These agents cause respiratory distress and tearing with the intention of incapacitating the victim. Most of the time irritating agents are non-fatal but in some severe circumstances, these agents can result in asphyxiation. Symptoms: Severe pain to the skin, especially the moist areas of the body. Burning and irritation of the eyes and throat. Respiratory distress. Coughing and choking. Nausea and vomiting. Most exposed people smell of pepper or tear gas.

Treatment:
- Irrigate
- Treat bronchospasm with bronchodilators and steroids, as needed.

**Patient decontamination for chemical exposure:**
1. Decontamination with water or soap and water will likely to be the most effective.
2. Hypochlorite solution – 0.5% used in decontamination on sound skin may be effective against liquid sulfur mustard if applied within five minutes of exposure.
3. Rapid decontamination is extremely critical to minimize dose and injury.
4. Extreme care is necessary for victims of blister agents during decontamination.
5. Caregivers without personal protective equipment (PPE) should not attempt to treat victims who have not been decontaminated.
6. It would be advisable to blot visible chemical agents.
7. Caregivers should avoid cross-contaminating victims by performing area wash-downs before assisting the next casualty and changing PPE as necessary.

**Explosive Devices**

An explosive device is any substance or article designed to explode, either by a rapid release of gas and heat or by a chemical reaction. Examples of explosive devices include homemade bombs, pipe bombs, letter bombs, dynamite and military ordinances, and fertilizer bombs. The dissemination of nuclear, biological and chemical agents as aerosols may often be attempted through the use of bombs or explosives.

Explosives used by terrorists are often classified by the following categories:

1. Unconventional use – a conventional object used in an unconventional way to create mass destruction, such as hijackers flying passenger planes into their intended targets, relying on the impact of the planes and their full fuel tanks to create havoc.
2. Vehicle bomb – usually large powerful devices that consist of a large quantity of explosives fitted with a timed or remotely triggered detonator packed onto a car or truck.
3. Pipe bomb – a quantity of explosives sealed into a length of metal or plastic pipe. A timing fuse usually controls detonation, but other methods can be used including, electronic timers, remote triggers, and motion sensors. These are the most common explosive device and are at the opposite end of the scale from vehicle bombs in terms of size and power.
4. Satchel charge – an old military term for an explosive device in a canvas-carrying bag. In recent history, “daypacks” or knapsacks have been used for the carrying device, while the explosives have contained antipersonnel materials such as nails and glass to inflict more casualties.
5. Package or letter bomb – the explosive material is contained in a package or letter that is usually triggered when opened.

Explosive Properties:

1. The larger the explosive charge, the greater the shock wave.
2. Mechanism of injury can be:
- Direct exposure to the blast wave
- Reflective blast waves
- Acceleration/deceleration forces
- Penetrating and non-penetrating wounds
- Burns and inhalation of toxic gases
- Building collapse

Resources:

- HCMS (Houston County Medical Society) Disaster Preparedness and Response: Biological and Chemical Agents Reference Chart, Houston Texas. October 2001
- Iowa Department of Public Health: Bioterrorism Agent and Chemical Table. November 6, 2001