BIOTERRORISM RECOGNITION AND RESPONSE

A BIOTERRORIST INCIDENT IS THE RELEASE OF A BIOLOGIC AGENT AMONG A CIVILIAN POPULATION FOR THE PURPOSE OF CAUSING FEAR, ILLNESS AND DEATH

BIOLOGIC AGENTS ARE CLASSIFIED INTO TWO GROUPS → BIOLOGICALLY PRODUCED TOXINS AND INFECTIOUS ORGANISMS

INFECTIOUS AGENTS ARE SUBDIVIDED INTO TWO CATEGORIES → CONTAGIOUS AND NON-CONTAGIOUS

THE CONTAGIOUS AGENTS OF GREATEST CONCERNS (SMALLPOX, PNEUMONIC PLAGUE AND CERTAIN VIRAL HAEMORRHAGIC FEVERS) ARE PERSO-TO-PERSON INFECTIOUS THROUGH AIRBORNE OR DROPLET TRANSMISSION

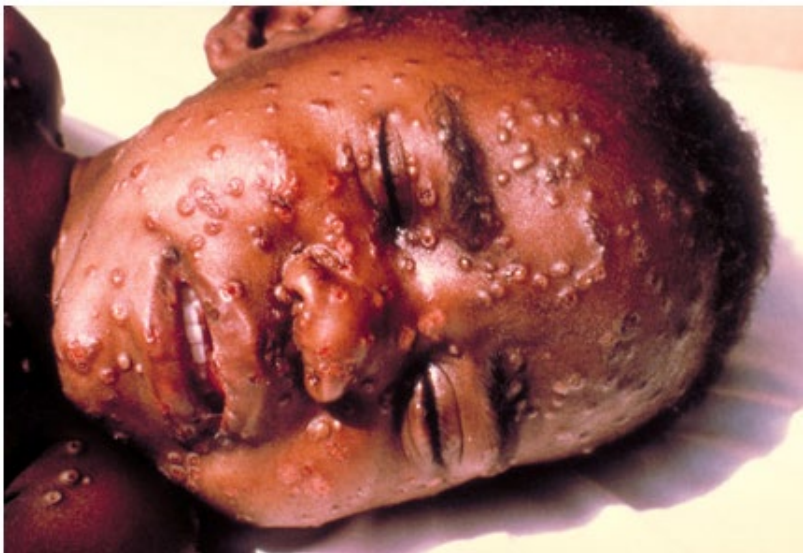
CLASS-A AGENTS ARE THOSE OF GREATEST CONCERN → VARIOLA MAJOR (SMALLPOX), BACILLUS ANTHRACIS (ANTHRAX) AND YERSINIA PESTIS (PLAGUE)

RECOGNITION OF A BIOTERROSISM INCIDENT:

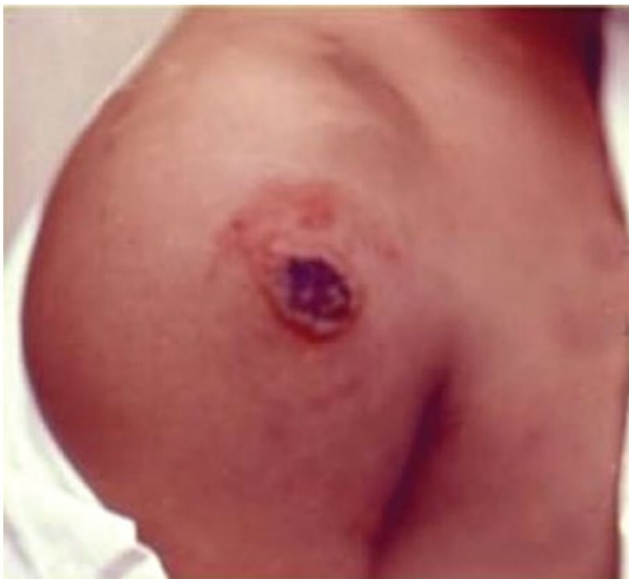
- Unless the release of an agent is openly announced, initial indications of attack may be subtle → early symptoms of most agents of concern are not readily distinguished from more common and less threatening illness → fever, myalgias and malaise
- The similarity in early symptoms also creates another response issue → once an attack becomes public, patients with any of those common symptoms may seek rapid evaluation in ED → extreme patient volume and diagnostic challenge should be anticipated
- ED physicians should have operational knowledge of the biologic agents of concern or understand where to readily access this information
- The emergency clinican should also be prepared to appropriately respond to notification of a potential disease by another health or medical professional
- Any recommended treatment will necessarily involve coordination with outside agencies (public health and law enforcement)
- Methods for detection of a biologic event include the recognition of unusual epidemiologic phenomena such as a high incidence of nonspecific illness, clusters or large numbers of rapidly fatal cases and steep ifection curves through public health surveillance systems
- Characteristics of class A bioterror agents are outlined below, as well as images of the more feared cases.

Table 10-1 Infectious Agents of Concern as Defined by the Centers for Disease Control and Prevention

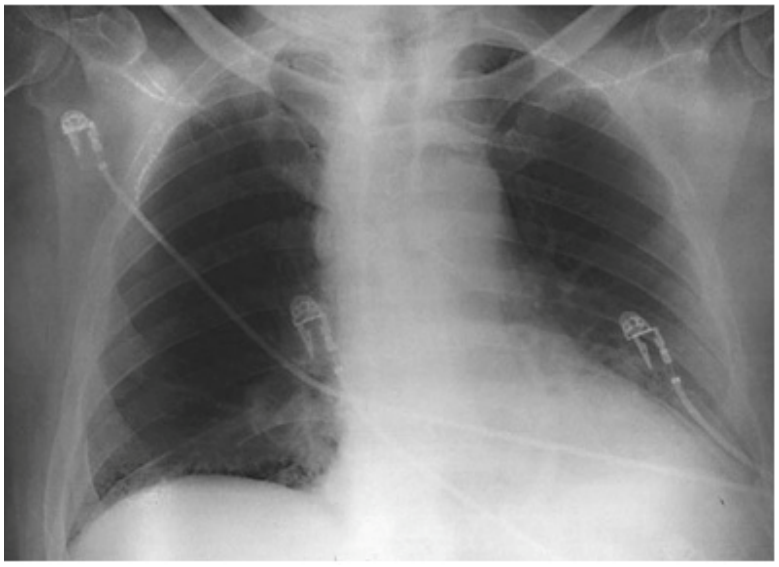
Biologic Agent	Disease Caused	Incubation Period	Signs and Symptoms
Class A agents			
Variola major	Smallpox (Figure 10-1)	12–14 d	Initially fever, severe myalgias, prostration; followed within 2 d by papular rash on the face spreading to extremities (affecting palms and soles) and then to trunk (lesser extent than chickenpox); lesions progress at same rate, becoming vesicular and then pustular with subsequent scab formation
Bacillus anthracis	Cutaneous anthrax (Figure 10-2)	Usually <1 d, up to 2 wk reported	Macule or papule enlarging into eschar with surrounding vesicles and edema; sepsis possible, less common
	GI anthrax	Usually 1–7 d	Abdominal pain, vomiting, GI bleeding progressing to sepsis; mesenteric adenopathy on CT
	Oropharyngeal anthrax	Usually 1–7 d	Sore throat, ulcers on base of tongue, marked unilateral neck swelling
	Inhalational anthrax (Figure 10-3)	Usually <1 wk, 43 d reported at Sverdlovsk*	First stage is nonspecific (fever, dyspnea, cough, headache, vomiting, abdominal pain, chest pain); second stage (dyspnea, diaphoresis, shock); hemorrhagic mediastinitis with widened mediastinum on x-ray
Yersinia pestis	Bubonic plague	2–8 d	Initially fever, chills, painful swollen lymph node(s); node progresses to bubo (sometimes suppurative)
	Pneumonic plague	2–3 d	Fever chills, cough, dyspnea, nausea, vomiting, abdominal pain; clinical condition consistent with gram-negative sepsis
	Primary septicemic plague	2–8 d	After bubo formation, the clinical condition is consistent with gram-negative sepsis, disseminated intravascular coagulation
Clostridium botulinum	Foodborne botulism	1–5 d	GI symptoms followed by symmetric cranial neuropathies, blurred vision, progressing to descending paralysis
	Inhalational botulism†	12–72 h	Symmetric cranial nerve palsies followed by descending paralysis
Francisella tularensis	Tularemia	2–5 d	Abrupt nonspecific febrile illness progressing to pleuropneumonitis; may have mucocutaneous lesions
Filoviruses and arenaviruses (Ebola virus)	Viral hemorrhagic fevers	2 d–3 wk, depending on virus	Initial nonspecific febrile illness, sometimes with rash; progresses to bloody vomiting, diarrhea, shock



Smallpox → initially fever, myalgias, prostration followed within 2 days by papular rash on the face spreading to extremities that progresses at the same rate forming vesicles then pustules



Ulcer and eschar of cutaneous anthrax. Macule or papule enlarging into eschar with possible sepsis



CXR of widened medistinum characteristic of inhalational anthrax. First stage non-specific, followed by SOB, diaphoresis and shock in second stage with haemorrhagic mediastinitis in second stage.

INITIAL RESPONSE TO BIOTERROISM INCIDENT:

- Every receiving facility and ED should have standard operating procedures to manage a bioterrorism threat or actual incident and these should be incorporated into the all-hazards plan
- Initial actions taken by the ED physician can be pivotal in the success of the hospital actions and the overall community response
    - ACTIVATION OF PROCESSES/PROCEDURES
    - Implentation of appropriate infection control procedures
    - Notification of key departments (law enforcement, public health etc)
    - Information flow to all hospital personnel
    - Control of media messages

INTEGRATION WITH THE LOCAL HEALTH DEPARTMENT:

- The ED physician can expect to interface with multiple diverse agencies in an ongoing fashion, the most critical of which is the local public health department
- The most important assistance that public health can provide to all clinicians is in the development of a community-wide patient evaluation and treatment protocol → provides uniform method across a community to evaluate patients presenting with possible exposure. The reporting format should promote rapid processing of the data, with dissemination back to the reporting sources

TREATMENT, PROPHYLAXIS AND IMMUNISATION:

- General principles need to be understood
- Morbidity and mortality are minimised by preventing exposure, providing prophylaxis and immunisation as appropriate and treating the infected → may be indicated even without obvious signs of disease

Table 10-2 Category A Agents: Treatment, Prophylaxis, and Vaccination

Biologic Agent	Vaccination	Prophylaxis	Treatment
Class A agents			
Variola major	Vaccinia vaccination: currently not recommended for general public use because of its association with limited numbers of deaths and complications in immunocompromised individuals and those with eczema; useful in preventing disease if given within 4 d of exposure	Vaccinia immune globulin: best given within 2–3 d of exposure; limited supplies are available; consider giving to those exposed who have contraindications to vaccine	Supportive
Bacillus anthracis	Anthrax vaccination: six-part series vaccination at 0, 2, and 4 wk and then at 6, 12, and 18 mo; annual boosters required; currently not available to the public; efficacy in preventing inhalational anthrax demonstrated in animal models	Ciprofloxacin or doxycycline for 60 d (amoxicillin if strain not resistant); 60-d term established by using latency period for last infection occurring at Sverdlovsk*; consideration for concurrent vaccination	For presumed inhalational anthrax: ciprofloxacin or doxycycline (amoxicillin if strain not resistant) *in combination* with two others, including clindamycin, rifampin, imipenem, aminoglycoside, chloramphenicol, vancomycin, streptomycin, and some macrolides, until sensitivity testing completed
Yersinia pestis	Killed whole bacilli vaccine no longer available by producers; vaccine had efficacy in preventing bubonic disease but not the pneumonic form	Ciprofloxacin or doxycycline; alternative: chloramphenicol; prophylaxis for 7 d	Streptomycin or gentamicin preferred choices; alternatives: doxycycline, ciprofloxacin, chloramphenicol
Clostridium botulinum	Vaccine not available to the public: pentavalent toxoid of *C. botulinum* toxin types A–E; three-part series with yearly booster	Not applicable	Antitoxin: requires procurement through local public health agency (state or the Centers for Disease Control and Prevention); antitoxin may preserve remaining neurologic function but does not reverse paralysis; may require prolonged, assisted mechanical ventilation and supportive care
Francisella tularensis	Live attenuated vaccine under investigation by U.S. Food and Drug Administration	Ciprofloxacin or doxycycline for 14 d	Streptomycin or gentamicin preferred choices; alternatives: doxycycline, ciprofloxacin, chloramphenicol
Filoviruses and arenaviruses (e.g., Ebola virus)	Not applicable	Not applicable	Supportive therapy; ribavirin may have applicability in arenaviruses

INCIDENT-SPECIFIC FACTORS TO YOUR HOSPITAL:

- Relate to medical surge, disease containment, ED/hospital staffing and supply management, patient management and fatality management
- MEDICAL SURGE → medical surge capability refers to the ability to manage patients requiring unusual or very specialised medical evaluation and care
- DISEASE CONTAINMENT → infection control guidelines for the diagnosed or suspected agent should be put into practice for protection of staff, visitors and other patients. Fortunately, most agents of concern require standard precautions (gloves, gown, splash precautions). The more troubling agents are those that are contagious through airborne or droplet transmission. Smallpox is airborne → full

isolation. DECONTAMINATION should only be considered if a patient presents shortly after acute exposure to a substance suspected or confirmed as a biologic agent.

- STAFFING → self-explanatory
- SUPPLY MANAGEMENT → inventory may limit the amount of vaccine, antibiotics and other pharmaceuticals available. Vendors for back-up supplies and equipment are commonly shared by multiple institutions, each counting the back-up cache as their own → need community-wide mutual aid system.
- PATIENT MANAGEMENT → preprinted instructions indicating category of risk stratification and why the patient was placed in that category can be helpful, as well as measures that prevent spread and early signs and symptoms of disease with appropriate steps if they should occur.
- FATALITY MANAGEMENT → large numbers of fatalities can pose a burden on any health care system.