Bioterrorism Treatment Guidelines

Illinois Department of PUBLIC HEALTH

Agent Characteristics

	Transmit person to person	Incubation period	Lethality (approx case fatality rate)
Inhalational Anthrax	No	Usually 1-7 days; may be over 43 days in rare cases	45-90%
Botulism	No	12-72 hours	<10% with ventilation support
Brucellosis	Rare	5 days-6 months	<5% untreated
Cholera	Rare	4 hrs-5 days	Low with treatment, high without (50%)
Glanders	Low	10-14 days	>50%
Pneumonic Plague	High	Adults: 1-6 days Peds: 3-4 days	High unless treated in 12-24 hours (~ 60%)
Q Fever	Rare	10-40 days	Very low
Ricin	No	ARDS can start 12-24 hrs; death within 36-48 hrs	High
Smallpox	Moderate to high	7-17 days	Variola Major: ~ 30% Variola Minor: ~ 1%
Staph Enterotoxin B	No	3-12 hrs	<1% (depends on dose)
T-2 Mycotoxins	No	2-4 hrs	Moderate (depends on dose)
Pneumonic Tularemia	No	3-5 days; range 1-14 days	Moderate if untreated (30-60%)
Venezuelan Equine Encephalitis	No	1-6 days for VEE; 4-15 days for WEE and EEE	<1%
Viral Hemorrhagic Fevers	Moderate	2-21 days	Depends on virus; Low-90%

Source: Centers for the Study of Bioterrorism & Emerging Infections 3/02

How to Recognize the Epidemiological Signs of a Potential Bioterrorism Event

Look for the following clues that may suggest a bioterrorism event has occurred:

- An unusual increase or clustering of patients presenting with unexplained illness and any of the following:
  - Sepsis
  - Pneumonia
  - Flacid muscle paralysis
  - GI illness
  - Bleeding disorders
  - Severe flu-like illness
  - Rash
  - Encephalitis/meningitis
- An unusual or impossible pathogen for your region in a patient without a travel history to an endemic area (e.g., a case of plague in a patient that does not live in, or has not traveled to, the southwest region of the U.S.).
- An unusual temporal and/or geographical clustering of illness (e.g., persons who attended the same public event or gathering).
- Simultaneous disease outbreaks in human and animal populations.

Table 1:

Category	Initial Therapy (Oral)	Duration
Adults (including pregnant women and pregnant adolescents)	Ciprofloxacin 400 mg IV every 12 hrs ***or*** Doxycycline 100 mg IV every 12 hrs ***and*** One or two additional antimicrobials*	IV treatment initially, switch to PO when clinically appropriate (see Table 1 for PO dosing). Treat for a total of 60 days (IV & PO combined).
Children	Ciprofloxacin 10-15 mg/kg every 12 hrs (not to exceed 1 g/day) ***or*** Doxycycline: >8 yrs and >45 kg: 100 mg every 12 hrs ***and*** One or two additional antimicrobials* All other children: 2.2 mg/kg every 12 hrs ***and*** One or two additional antimicrobials*	IV treatment initially, switch to PO when clinically appropriate (see Table 1 for PO dosing). Treat for a total of 60 days (IV & PO combined).
Immunocompromised individuals	Same for non-immunocompromised adults and children	Same for non-immunocompromised adults and children

* Additional antimicrobials include rifampin, vancomycin, penicillin, ampicillin, chloramphenicol, imipenem, clindamycin and clarithromycin.

Table 2: Prophylaxis inhalational anthrax exposure in patients ***without*** systemic signs or symptoms.

Category	Initial Therapy (Oral)	Duration
Adults (including pregnant women and pregnant adolescents)	Ciprofloxacin 500 mg BID ***or*** Doxycycline 100 mg BID	60 days*
Children	Ciprofloxacin 10-15 mg/kg every 12 hrs (not to exceed 1 g/day) ***or*** Doxycycline: >8 yrs and >45 kg: 100 mg every 12 hrs All other children: 2.2 mg/kg every 12 hrs	60 days*
Immunocompromised individuals	Same for non-immunocompromised adults and children	60 days*

* Previous treatment guidelines for inhalational anthrax suggested 7 to 10 days of therapy; however with the potential for bioterrorism, 60 days is recommended because of possible inhalational exposure.

INHALATIONAL ANTHRAX

Incubation Period:

1 to 43 days and *up to two months for children.*

Signs/Symptoms:

First Phase

Non-specific viral-like symptoms such as low-grade fever, nonproductive cough, malaise, fatigue, myalgias, diaphoresis and chest discomfort (*poor feeding/suck for pediatrics*).

Second Phase

1) 1 to 5 days after onset of initial symptoms, there will be an abrupt onset of high fever and respiratory distress (dyspnea, stridor, cyanosis).

2) Shock and death within 24 to 36 hours after onset of second phase of illness.

Treatment:

(see tables, over)

Clinical Guidance Regarding Testing and Prophylaxis for Anthrax

Asymptomatic patient WITHOUT credible exposure or risk

- Provide reassurance about rarity of infection without known exposure.
- No screening test is available.
- Nasopharyngeal swabs and blood cultures should NOT be used.

Asymptomatic patient WITH credible exposure

No screening tests are available for diagnosing of anthrax in asymptomatic patients.

- Conduct individual risk assessment (responsibility of investigative team).
- Environmental samples may be collected to determine risk to patient (must be approved by CDC and/or investigators prior to collection).
- If within 12-24 hrs and/or if they have not showered or changed their clothing since time of exposure, direct patient to change clothing and shower with soap and water ASAP (place clothes in bag or sealed container).
- Provide post-exposure prophylaxis as soon as possible after exposure is known or suspected and continue for 60 days or until exposure is ruled out.

Pneumonic Plague, p.2

Recommended Therapy for a Contained Casualty Setting—One antimicrobial agent should be selected. Therapy should be continued for 10 days.

Adults: *Preferred Choices* Streptomycin: 1 g IM twice daily ***or*** Gentamicin: 5 mg/kg IM or IV once daily ***or*** 2 mg/kg loading dose followed by 1.7 mg/kg IM or IV 3 times daily	*Alternative Choices* Doxycycline: 100 mg IV twice daily ***or*** 200 mg IV once daily ***or*** Ciprofloxacin: 400 mg IV twice daily ***or*** Chloramphenicol: 25 mg/kg IV 4 times daily
Children: *Preferred Choices* Streptomycin: 15 mg/kg IM twice daily (maximum daily dose, 2 g) ***or*** Gentamicin: 2.5 mg/kg IM or IV 3 times daily	*Alternative Choices* Doxycycline: If ≥45 kg, use adult dosage If <45 kg, 2.2 mg/kg IV twice daily (maximum, 200 mg/d) ***or*** Ciprofloxacin: 15 mg/kg IV twice daily ***or*** Chloramphenicol: 25 mg/kg IV 4 times daily
Pregnant women and adolescents: *Preferred Choice* Gentamicin: 5 mg/kg IM or IV once daily or 2 mg/kg loading dose followed by 1.7 mg/kg IM or IV 3 times daily	*Alternative Choices* Doxycycline: 100 mg IV twice daily ***or*** 200 mg IV once daily ***or*** Ciprofloxacin: 400 mg IV twice daily

Mass Casualty Setting and Post-Exposure Prophylaxis—Duration of treatment of plague in mass casualty setting is 10 days. Duration of post exposure prophylaxis to prevent plague infection is 7 days.

PNEUMONIC PLAGUE

Incubation Period:

1 to 6 days

Signs/Symptoms:

1) Sudden high fever, chills, headache, malaise, nausea and vomiting.
2) Severe respiratory symptoms consistent with pneumonia soon follow with cough, sputum production, and hemoptysis. Early hemoptysis is an important clue in differentiating plague from other inhaled agents of bioterrorism. Tachycardia, tachypnea and cyanosis also may be present.

Treatment: Respiratory isolation necessary.

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Treatment:

Supportive care, along with antibiotics as indicated for treatment of occasional secondary bacterial infections. Use respiratory isolation precautions.

SMALLPOX

Incubation Period:

Range: 7 to 17 days

Initial Symptoms:

Fever, malaise, head and body aches, sometimes vomiting.

Days 1 to 5: Contagious

Macular rash appears on the tongue and mouth. Sores develop; break open, spreading virus into the oral cavity. The rash spreads to all parts of the body within 24 hours.

Day three rash becomes **papular**. By day four, papules become **vesicles** filled with thick, opaque fluid with a depression in the center that looks like a belly-button (major distinguishing characteristic of smallpox). At this time fever rises until scabs form.

Days 5 to 10: Very Contagious

The vesicles become **pustules**, sharply raised, usually round and firm to the touch. They feel like there is a small round object under the skin; it has been described as if there is a BB pellet embedded under the skin.

Days 11 to 14: Contagious

The pustules form a crust and then **scab.**

Days 15 to 21: Contagious

The scabs begin to fall off.

Days 21 and Beyond: Not Contagious

Scabs fall off. Patient is no longer contagious.

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Differentiating Smallpox From Varicella (Chicken Pox)

	Smallpox	Varicella
Prodrome	High fever (>102° F) and systemic symptoms (prostration, severe headache, backache, abdominal pain, or vomiting) 1-4 days **before** rash onset	No or mild prodrome before rash onset
Location of First Lesion(s)	Oral mucosa/palate (enanthem); followed by examthem (rash) on face or forearm	Trunk (occasionally face)
Characteristics of Rash	Deep, firm, well-circumscribed pustules; may be confluent or umbilicated	Typically superficial vesicles
	Concentrated on face and distal extremities (centrifugal)	Concentrated on trunk and proximal extremities (+/- face, scalp)
	Lesions in same stage of evolution on any one part of the body	Rash appears in crops so lesions are in different stages of evolution (papules, vesicles, scabs) on any one part of the body
	Lesions on palms and soles (seen in >50% of cases)	Very uncommon for lesions to appear on palms and soles
	Lesions may itch at scabbing stage	Lesions generally intensely itchy
	Lesions evolve from papule ➡ pustule in days	Lesions generally evolve from macules to papules to vesicles to scabs in <24 hours
Duration of Illness	Illness lasts 14-21 days	Illness lasts 4-7 days

Category	Contained Casualty Setting	Mass Casualty Setting and Post-Exposure Prophylaxis
Adults (including pregnant women)	*Ribavirin* Loading dose: 30 kg IV once (max dose 2 gm); Then 16 mg/kg IV every 6 hrs x 4 days (max dose 1 gm); Then 8 mg/kg IV every 8 hrs x 6 days (max dose 500 mg)	*Ribavirin* Loading Dose: 30 mg/kg PO once If > 75 kg, 1,200 mg/day PO in 2 divided doses x 10 days If ≤ 75 kg, 1,000 mg/day PO in divided doses. (400 mg in AM; 600 mg in PM) x 10 days
Children	*Ribavirin* Loading dose: 30 kg IV (max dose 2 gm); Then 16 mg/kg IV every 6 hrs x 4 days (max dose 1 gm); Followed by 8 mg/kg IV every 8 hrs x 6 days (max dose 500 mg)	*Ribavirin* Loading Dose: 30 mg/kg PO once; Then 15 mg/kg/day PO in 2 divided doses x 10 days
Pregnant Adolescent	Same as for children	Same as for children
Immunocompromised patients	Same as for non-immunocompromised patients	Same as for non-immunocompromised patients

Precautions:

Isolation (airborne precautions, contact precautions) should be utilized.
Supportive care is the mainstay of therapy.

VIRAL HEMORRHAGIC FEVER

Incubation Period:

2 days to 3 weeks

Signs/Symptoms:

1) Marked fever, fatigue, dizziness, muscle aches, loss of strength, and exhaustion.
2) Bleeding under the skin, in internal organs, or from body orifices like the mouth, eyes, or ears. Severely ill patient cases: shock, nervous system malfunction, coma, delirium, seizures, renal (kidney) failure.

Treatment:

Please note: Ribavirin is **NOT** FDA-approved, but may be effective in the treatment of a subset of the viruses that cause viral hemorrhagic fever.

ALPHAVIRUSES (Equine Encephalitides)

Eastern Equine Encephalomyelitis (EEE), Western Equine Encephalomyelitis (WEE) and Venezualen Equine Encephalomyelitis (VEE)

Signs/Symptoms:

Fever, headache and myalgia. Few will progress to frank encephalitis; infants and the elderly are more prone to developing encephalitis.

Treatment:

There is no specific treatment; treatment is supportive.

Prophylaxis:

1) Inactivated vaccines are available for EEE, WEE and VEE but have been associated with poor immunogenicity and need for multiple doses.
2) A live attenuated vaccine is available for VEE, but has a high incidence of side effects such as fever, headache and malaise.

BOTULISM

Incubation Period:

1) Infant botulism: 2 to 4 weeks.
2) Food-borne exposure: GI tract symptoms — 18 to 36 hours; Neurologic symptoms — 12 to 36 hours.
3) Wound Botulism: 4 to 14 days.
4) Inhalational exposure: Neurologic symptoms — 24 to 72 hours.

Signs/Symptoms:

1) Infant: First signs of the illness are in the cranial nerves. Generalized hypotonia, listlessness, lethargy and poor feeding soon ensue. Typical patient has expressionless face, feeble cry and poor head control. The gag, suck and swallow reflexes are impaired, as well as the corneal reflex, if tested repetitively.
2) Food borne: Nausea and vomiting followed by symmetrical cranial neuropathies (e.g., ptosis, diplopia, blurred vision, mydriasis, sore throat, dysphagia, dysphonia) and descending weakness and paralysis, including involvement of respiratory muscles with respiratory distress leading to respiratory failure.
3) Wound: Same as food-borne but without the GI symptoms.
4) Inhalational: Same as food-borne but without the GI symptoms.

Treatment:

Supportive care, including respiratory support and botulinum antitoxin.

The CDC recommends that only one 10 ml vial of the trivalent antitoxin be administered to poisoned patients.

Category	Initial Treatment	Duration
Adults	Doxycycline: 200 mg/day PO q d ***and*** Streptomycin: 1 g IM per day ***or*** Rifampin: 600 mg PO per day	Doxycycline: 6 weeks Streptomycin: 2 to 3 weeks Rifampin: 6 weeks
Children >8 years	Doxycycline: 2-4 mg/kg/d PO QID or divided BID; not to exceed 200 mg/d ***and*** Stretpomycin: 1 g IM per day ***or*** Rifampin: 15-20 mg/kg/d PO	4 to 6 weeks
Children ≤8 years	Trimethoprim-sulfamethoxazole (TMP-SMX): 8-10 mg/kg/d (based on trimethoprim); not to exceed 2 double-strength tab/d ***and*** Rifampin: 15-20 mg/kg/d PO	45 days
Children >8 years with meningitis,* endocarditis, or osteomyelitis	Doxycycline: 2-4 mg/kg/d PO QD or divided BID; not to exceed 200 mg/d ***and*** Streptomycin: 20 mg/kg/d IM; not to exceed 1 g/d ***or*** Gentamicin: 3-5 mg/kg/d IM/IV divided q8h	Doxycycline: 4 to 6 months Streptomycin: 1 to 2 weeks Gentamicin: 1 to 2 months
Children ≤8 years with meningitis,* endocarditis, or osteomyelitis	TMP-SMX: 8-10 mg/kg/d PO divided BID (based on TMP component) Rifampin: 15-20 mg/kg/d PO	4 to 6 months
Pregnant adults and adolescents	TMP/SMX: 200 mg/day PO once daily ***and*** Streptomycin: 1 g IM per day ***or*** Rifampin: 600 mg PO per day	TMP/SMX: 6 weeks Streptomycin: 2 to 3 weeks Rifampin: 6 weeks

* Use of corticosteroids as adjunctive therapy to antibiotics may be of benefit in culture-proven meningitis.

BRUCELLOSIS

Incubation Period:

5 days to more than 6 months.

Signs/Symptoms:

1) Acute Form (<8 weeks from onset): "flu-like" symptoms including fever, profuse sweating, malaise, anorexia, headache, myalgia and back pain. Neurologic infection and pericarditis or endocarditis in severe cases.
2) Undulant Form (<1 year from onset): undulant fevers, arthritis and orchiepididymitis in young males.
3) Chronic Form (>1 year from onset): symptoms may mimic chronic fatigue syndrome, with episodes of depression.

Treatment:

Chemoprophylaxis for the exposed, asymptomatic patient is not recommended. No human vaccine for brucellosis is available. ***(see tables, over)***

Surgical Care:

Surgical intervention may be required to drain pyogenic joint effusions or rare paraspinal abscesses.

Treatment:

Isolation of infected individuals will be necessary.

Localized disease without systemic symptoms:

Can use either:

1) Amoxicillin/Clavulanate 60 mg/kg/dose divided TID (for local disease or mild toxicity) ***or***

2) TMP/SMX (Trimethoprim/sulfamethoxazole) with TMP 4 mg/kg/dose and SMX 20 mg/kg/dose divided BID ***or***

3) Tetracycline 40 mg/kg/day divided TID (for adults and children >8 years old).å

Localized disease with mild systemic symptoms:

Using a combination of two of the above oral regimens is recommended for 30 days, followed by monotherapy with either amoxicillin/clavulanate ***or*** TMP/SMX for 60 to 150 days.

For severe systemic disease:

1) Ceftazidime IV, 120 mg/kg/day divided TID combined ***with***

2) TMP/SMX (TMP 8 mg/kg/day and SMX 40 mg/kg/day) divided QID for 2 weeks.

Prophylaxis:

No vaccine exists for Glanders.

GLANDERS

Incubation Period:

10 to 14 days

Signs/Symptoms:

1) Cutaneous infection: Nodules and ulcerations at site of infection. Possible lymphangitis with eruptions and ulcers along the lymphatic system.
2) Upper respiratory infection: mucopurulent discharge from the oral, nasal and/or conjunctival mucosa. Nodules and ulcers on the septum and turbinates is possible.
3) Pulmonary infection: Dyspnea, bronchopneumonia, lobar or segmental pneumonia and necrotizing nodular lesions.
4) Septicemic form: Fever, rigors, sweats, myalgias, pleuritic chest pain, photophobia, lacrimation and diarrhea. Physical examination may reveal fever, tachycardia, cervical adenopathy and mild splenomegaly. Mild leukocytosis with a shift to the left or leukopenia. Fatal within 7 to 10 days.

Laboratory and Diagnostic Testing:

1) Chest x-ray: Look for miliary nodules (0.5-1.0 cm), small multiple lung abscesses, bronchopneumonia, lobar pneumonia, necrotizing nodular lesions.
2) Labs:
   a) Gram stain of lesion exudates may reveal scant small bacilli with methylene blue stain.
   b) Blood, sputum or urine culture (may grow rapidly on meat nutrient mediums and other specialized mediums).
   c) CBC - mild leukocytosis with left shift (*and bandemia in pediatrics*) may be seen.
   d) *Erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) may be elevated in children.*

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Category	Initial Therapy	Duration
Adults	Doxycycline: 100 mg PO, BID ***or*** Tetracycline: 500 mg PO, QID *Quinilones, chloramphenicol and trimethoprim-sulfamethoxazole are also probably effective*	15 to 21 days
Children > 8 years old	Doxycyline: If ‡ 45 kg, 100 mg PO, BID If <45 kg, 2-5 mg/kg BID (maximum dose 200 mg/d)	15 to 21 days
< 8 years old	Co-trimoxazole: 4 mg/kg BID ***or*** Chloramphenicol: 12.5 mg/kg PO, BID	15 to 21 days

Category	Prophylaxis	Duration
Adults	Doxycycline: 100 mg PO, BID ***or*** Tetracycline: 500 mg PO, QID	Treat for 5 to 10 days. Treatment may be started 8 to 12 days after exposure. If started prior to this time, onset of illness may be delayed, but not prevented.
Children	Doxycycline: 100 mg PO, BID ***or*** Tetracycline: 25-50 mg/kg PO, QID	Treat for 7 to 14 days. Treatment may be started 8 to 12 days after exposure. If started prior to this time, onset of illness may be delayed, but not prevented.

Q FEVER

Incubation Period:

10 to 40 days

Signs/Symptoms:

1) Flu-like illness or atypical pneumonia and may include high fever, severe headache (retro-orbital pain), general malaise, myalgias, confusion, sore throat, chills, sweats, nonproductive cough, nausea, vomiting, diarrhea, abdominal pain and chest pain *(meningismus in children)*.

2) Pneumonia may develop in 30 to 50 percent of symptomatic patients.

3) Abnormal liver function tests may be seen.

Diagnosis:

Confirmation is made by specialized antibody testing by ELISA or fluorescent antibody testing.

Treatment:

There is not a commercially-available vaccine for Q fever.

(see tables, over)

Recommended Therapy For A Contained Casualty Setting — Persons beginning treatment with parenteral antibiotics can switch to oral antibiotics when clinically indicated.

Adults: *Preferred Choices* Streptomycin: 1 g IM twice daily x 10 days ***or*** Gentamicin: 5 mg/kg IM or IV once daily x 10 days	*Alternative Choices* Doxycycline: 100 mg IV twice daily x 14 days ***or*** Chloramphenicol: 15 mg/kg IV 4 times daily x 14 days ***or*** Ciprofloxacin: 400 mg IV twice daily x 10 days
Children: *Preferred Choices* Streptomycin: 15 mg/kg IM twice daily (should not exceed 2 g/d) x 10 days ***or*** Gentamicin: 2.5 mg/kg IM or IV 3 times daily x 10 days	*Alternative Choices* Doxycycline: If weight ≥ 45 kg, 100 mg IV twice daily x 14 to 21 days If weight <45 kg, 2.2 mg/kg IV twice daily x 14 to 21 days ***or*** Chloramphenicol: 15 mg/kg IV 4 times daily x 14 days ***or*** Ciprofloxacin: 15 mg/kg IV twice daily x 10 days
Pregnant women and adolescents: *Preferred Choices* Gentamicin: 5 mg/kg IM or IV once daily x 10 days ***or*** Streptomycin: 1g IM twice daily x 10 days	*Alternative Choices* Doxycycline: 100 mg IV twice daily x 14 to 21 days ***or*** Ciprofloxacin: 400 mg IV twice daily x 10 days

TULAREMIA

Incubation Period:

Usually 3 to 5 days

Signs/Symptoms:

1) Sudden high fever, chills, headache, malaise, myalgias, arthralgias and progressive weakness. *Acute febrile illness, progressing to pharyngitis, bronchiolitis, pneumonitis, pleuritis, and lymphadenitis for pediatric patients*.
2) The respiratory component is a slow indolent course with a dry cough and progressive symptoms with progressive debilitation including sepsis, pneumonia (evidenced by chest pain, dyspnea, bloody sputum) and respiratory failure.

Treatment:

Infected patients do not need isolation.

Mass Casualty Setting and Post-Exposure Prophylaxis — One antibiotic, appropriate for patient age, should be chosen from among alternatives.

Adults Doxycycline: 100 mg orally twice daily x 14 days ***or*** Ciprofloxacin: 500 mg orally twice daily x 14 days
Children Doxycycline: If ≥ 45 kg, 100 mg orally twice daily; If <45 kg, 2.2 mg/kg orally twice daily x 14 to 21 days ***or*** Ciprofloxacin: 15 mg/kg IV orally twice daily (not to exceed 1 gm/day) x 10 days
Pregnant women and adolescents Doxycycline: 100 mg orally twice daily x 14 to 21 days ***or*** Ciprofloxacin: 500 mg orally twice daily x 10 days (maximum dose for adolescents is 1 gm/day)

CLOSTRIDIUM PERFRINGENS TOXINS

Incubation Period:

1 to 6 hours

Signs/Symptoms:

1) Pulmonary: See respiratory irritation, cough, bronchospasm, with severe cases developing ARDS and respiratory failure.
2) Cardiac: Tachycardia and/or hypotension.
3) GI: Nausea, vomiting and diarrhea.
4) CNS: Vacuoles form in nerve and brain cells resulting in dysfunction and death. Weakness, dizziness, ataxia, and coma leading to death.
5) Pancytopenia may be a late complication of severe exposure with resultant bleeding, bruising and immunosuppression.

Treatment:

No antidote exists for these toxins. Standard supportive care with airway precautions is the mainstay of treatment.

RICIN

Signs/Symptoms:

1) Inhalational Exposure: cough, chest tightness, dyspnea, nausea and myalgias. Severe exposures can develop into pulmonary edema and/or ARDS within 12 to 24 hours.
2) Ingestion: Severe gastroenteritis with profound vomiting, severe abdominal pain, cramping and diarrhea. Death is from multi-system organ failure.
3) Injection: Low doses — flulike symptoms, myalgias, nausea, vomiting and localized pain and swelling. Lethal amount — local tissue necrosis, massive gastroenteritis, GI bleeding and multi-system organ failure.

Treatment:

No specific treatment. Basic supportive care including fluids for management of gastroenteritis and airway/pulmonary management for treatment of inhalational exposure.

STAPHYLOCOCCAL ENTEROTOXIN B

Incubation Period:

Onset of action — 3 to 4 hours.

Signs/Symptoms:

1) Constitutional: Fever and myalgias.
2) Pulmonary: Cough, dyspnea, rales, pulmonary edema and pleuritic chest pain.
3) Cardiac: Tachycardia.
4) CNS: Headache.
5) GI: Nausea, anorexia and vomiting.
6) Severe exposures may lead to septic shock and death.

Treatment:

There is no antidote for SEB. Supportive care is the mainstay of treatment.

1) Fever: Antipyretics.
2) Pulmonary: Standard therapy including oxygen, bronchodilators, diuretics and airway support and control as needed.
3) GI: Fluids and anti-emetics as needed.

T-2 MYCOTOXIN

T-2 exposure should be considered when multiple symptomatic patients present and report exposure to "yellow rain" or droplets of yellow fluid.

Signs/Symptoms:

1) Skin: Pruritis, redness, vesicles, necrosis, epidermal sloughing.

2) CNS: Dysesthesias (distortion of any of the senses), ataxia.

3) GI: Nausea, vomiting and diarrhea.

4) Airway: Nose and throat pain, nasal discharge, itching and sneezing.

5) Pulmonary: Cough, dyspnea, wheezing, chest pain and hemoptysis.

6) Cardiovascular: Severe poisoning can cause weakness, decreased cardiac output, shock and death.

7) Heme: Bleeding disorders.

Treatment:

Decontamination:

Outer clothing should be removed and exposed skin should be decontaminated with soap and water. Eye exposure should be treated with copious saline irrigation. There is no specific treatment.

Supportive Care:

There is no antidotal therapy available for this toxin. The cornerstone of treatment is basic supportive care.

2) *E. coli* O157:H7 infection should usually not be treated with antimicrobials or antimotility agents as it may increase the risk for HUS.

3) Treatment of cholera requires large amounts of intravenous fluids and replacement of electrolytes. Oral administration of ciprofloxacin or doxycycline is effective for cholera.

4) No antimicrobial agent has proven efficacy for *C. parvum* infection.

FOOD-AND WATER-BORNE ILLNESSES

Incubation Period:

1 to 3 days

Signs/Symptoms:

1) GI: Diarrhea, nausea, vomiting, fever and abdominal cramps.
   a) *Shigella*: Blood or mucus in the stool.
   b) Cholera: Severe watery diarrhea.
   c) *E. coli* O157:H7: Bloody diarrhea.
   d) *Salmonella* or *Shigella*: Bloody diarrhea.
   e) *Salmonella typhi* and *S. paratyphi*: Typhoidal syndrome with fever, headache, malaise, myalgias and constipation; diarrhea is uncommon.
   f) *C. parvum*: Watery diarrhea, crampy abdominal pain.
2) Renal: *E. coli* O157:H7 hemolytic uremic syndrome (HUS). Hemolytic anemia, thrombocytopenia and renal insufficiency.

Treatment:

1) a) *Salmonella* is susceptible to quinolones, azithromycin and third-generation cephalosporins. Resistance to Trimethoprim-sulfamethoxazole (TMP/SMX) seems to be increasing and probably should not be used for treatment of salmonella infections.
   b) *Shigella* is susceptible to quinolones, TMP/SMX and azithromycin.

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Antidotal Therapy:

1) Potassium Iodide (KI): Used for individuals exposed to radioactive iodine. A one-time dose is usually all that is needed. *The FDA and WHO recommend that children from newborn to 18 years of age take KI unless they have a known allergy to iodine.*

Adults	130 mg tablet
Children ≥ 68 kg	130 mg tablet
Children 3-18 years old < 68 kg	One-half of a 130 mg tablet (65 mg)
Children 1 month to 3 years old	One-quarter of a 130 mg tablet (32 mg)
Infants from birth to one month of age	One eighth of a 130 mg tablet (16 mg)

2) Prussian Blue: Used to treat internal contamination with particles of radioactive cesium or thallium. Consult IDPH or the Illinois Poison Center for assistance in procurement of this antidote.

Supportive Care:

Treat associated traumatic injuries first.

1) Treat vomiting with anitemetics and IVF.
2) Monitor CBC.
3) Consider tissue, blood typing, and initiating prophylaxis for infectious agents if warranted.
4) Consult with radiation, hematology, and radiotherapy experts in regards to dosimetry, prognosis and treatment options:
   a) supportive care in a clean environment (e.g., burn unit)
   b) prevention and treatment of infections
   c) stimulation of hematopoiesis by use of growth factors
   d) stem cell transfusions or platelet transfusions (if platelet count is too low)
   e) psychological support

ACUTE RADIATION EXPOSURE

Signs/Symptoms:

Local Radiation Injury can cause loss of body hair on exposed parts, erythema, desquamation, blisters and local necrosis. Acute Radiation Sickness has four distinct stages. There also are three classic ARS syndromes described.

ARS Stages:

1) Prodromal stage (N-V-D stage): Nausea, vomiting and possibly diarrhea.
2) Latent stage: Generally looks and feels healthy for a few hours or even up to a few weeks.
3) Manifest illness stage: Symptoms depend on the specific syndrome and last from hours up to several months.
4) Recovery or death: Patients who do not recover will die within days to several months. Recovery process may last from several weeks up to two years.

ARS Syndromes:

1) Bone marrow syndrome (also referred to as hematopoietic syndrome): The primary cause of death is the destruction of the bone marrow, resulting in sepsis and hemorrhage.
2) Gastrointestinal (GI) syndrome: Destructive and irreparable changes in the GI tract and bone marrow usually cause infection, dehydration and electrolyte imbalance. Death usually occurs within 2 weeks.
3) Central Nervous System (CNS) syndrome: Patients experience confusion, disorientation, seizures, cerebral edema and coma. Death occurs within 3 days.

Treatment:

Decontamination:

Individuals contaminated with radioactive liquid or solids will need removal of clothes and irrigation.

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AMMONIA

Signs/Symptoms:

1) Airway: Burning sensation of the mouth, nose and pharynx. Serious exposures can result in swelling of the upper airway and larynx with stridor, muffled voice or aphonia.
2) Pulmonary: Bronchospasm, wheezing, cough
3) Cardiovascular: Secondary effects from hypoxia
4) CNS: Secondary effects from hypoxia
5) Dermal: Burning and irritation from concentrated solutions. Frostbite injury from contact from liquefied anhydrous ammonia is possible.
6) GI: Severe mucosal, esophageal and intestinal injury from ingestion
7) Ocular: Burning, irritation and swelling

Treatment:

1) Skin: Patients exposed to liquefied gas or large amounts of aqueous solution should have clothing removed and be decontaminated with water for at least five minutes.
2) Eyes: For symptomatic exposures, irrigate eyes for 30 minutes

Supportive care:

1) Support airway as clinically indicated
2) Treat bronchospasm with bronchodilators
3) Consider racemic epinephrine for pediatric patients with stridor
4) Treat burns as clinically indicated

Treatment:

Decontamination: Remove all exposed clothing and jewelry and irrigate all exposed areas with copious amounts of water for 30 minutes (acute exposures).

Enhanced Elimination: No methods of enhanced elimination are available for HF burns.

Antidotal Therapy:

1) Topical calcium and parenteral calcium are the mainstays of treatment of dermal burns.
2) Calcium gel: Apply and massage gel into the affected area.
3) Consider local infiltration with calcium gluconate if higher concentration HF exposure results in immediate tissue damage or erythema and pain persist following adequate irrigation. Infiltrate each square centimeter of the affected (painful) skin and subcutaneous tissue with about 0.5 milliliter of 10 percent calcium gluconate using a 30-gauge needle. This procedure is generally not recommended for fingers or toes.
4) Regional intravenous infusion of calcium gluconate, using a technique similar to the Bier block, is an option for HF burns of the forearm, hand or digits ***and*** topical or if local infiltration therapy has failed.
5) Intra-arterial Infusion: This technique is an option for treatment of digit burns and topical therapy has failed.

Supportive Care:

1) Pain control: Administer NSAIDS and narcotics.
2) Electrolytes: Treat hypocalcemia, hypomagnesemia and hyperkalemia.
3) Cardiac effects: Calcium gluconate or calcium chloride IV push.

HYDROFLUORIC ACID (Dermal Exposure)

Incubation Period:

1) <20 percent concentration - Erythema and pain may be delayed for 24 hours.

2) 20 to 50 percent concentration - Erythema and pain may be delayed for 8 hours.

3) >50 percent concentration - Immediate pain and erythema, rapid destruction of tissues and acute systemic toxicity.

Signs/Symptoms:

1) Airway: Upper airway and mucosal irritation.

2) Cardiovascular: Prolonged QTc and ventricular dysrythmias.

3) Pulmonary: Dyspnea, bronchospasm chemical pneumonitis, pulmonary edema (possibly hemorrhagic), tracheobronchitis, upper airway obstruction, chemical burns (larynx, trachea and bronchi) and ARDS.

4) Metabolic: Hypocalcemia, hypomagnesemia, hyperkalemia and acidosis.

5) Dermal: Pain, more severe burns may exhibit erythema, central blanching with peripheral erythema, swelling, vesiculation, serous crusting, ulceration, blue-gray discoloration and necrosis.

6) Eyes: Pain, conjunctival injection, corneal abrasion and corneal ulceration. Progressive corneal vascularization, scarring and corneal opacification may occur in a delayed fashion.

Laboratory and Diagnostic Testing:

Low concentration exposures may need pain control and antidotal treatment only. With exposure to higher concentrations, consider a calcium level, magnesium level, chem-7, EKG, and monitoring for dysrythmias.

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Sodium Nitrite

1) Adult: 300 mg over 5 minutes or more (10 mL of a 3 percent solution)

2) Pediatrics: 0.19 to 0.39 mL/kg of a 3 percent solution, or if the hemoglobin is known, use the following pediatric table:

Hemoglobin (grams)	Sodium Nitrite (mg/kg)	3 Percent Sodium Nitrite Solution (mL/kg)
7.0	5.8	0.19
8.0	6.6	0.22
9.0	7.5	0.25
10.0	8.3	0.27
11.0	9.1	0.30
12.0	10.0	0.33
13.0	10.8	0.36
14.0	11.6	0.39

Sodium Thiosulfate

1) Adult: 12.5 g over 10 minutes (50 mL of a 25 percent solution)

2) Pediatrics: 1.65 mL/kg of a 25 percent solution

Sodium thiosulfate may be considered as a single agent for treatment of cyanide poisoning, especially in suspected cases that have not been confirmed.

HYDROGEN CYANIDE

Signs/Symptoms:

1) CNS: Excitement, dizziness, nausea, vomiting, headache, coma and seizures.

2) Cardiovascular: Early findings may include hypertension and tachycardia. Bradycardia and hypotension are commonly seen later.

3) Pulmonary: Dyspnea, chest tightness, tachypnea, progressing to cyanosis and pulmonary edema.

4) Metabolic: High anion gap metabolic acidosis secondary to a lactic acidosis.

Treatment:

Decontamination: Exposed to gas only: do not need decontamination. Exposed to cyanide-containing liquid or solution should be decontaminated with water; a mild soap may be used. Patients should be decontaminated prior to entry to the hospital.

Antidotal Therapy: Taylor Cyanide Antidote Kit®: Contains three separate components – amyl nitrite perles, sodium nitrite and sodium thiosulfate.

Dosing:

Amyl Nitrite

1) Use if IV access is delayed or not possible

2) Crush 1-2 capsules into gauze

3) Have patient inhale amyl nitrite through gauze, or place gauze within facemask, over intake valve of bag-valve-mask device or port access to ET tube during assisted ventilation

4) Alternate every 30 seconds with 100 percent oxygen

5) Discontinue use when IV access obtained and sodium nitrite given. If no IV access within 3 minutes, give second capsule

METHYL ISOCYANATE

(Isocyanomethane, isocyanatomethane, methylcarbylamine, MIC)

Signs/Symptoms:

1) Skin: Irritation, burning sensation, chemical burns.

2) HEENT: May cause permanent damage with cataract formation or chronic blepharitis.

3) Pulmonary: Low concentrations: mild respiratory irritation. High concentrations: cough, dyspnea, increase secretions, chest pain, tightness and asthmatic episodes.

4) CNS: Hypoxia may produce CNS depression.

5) GI: GI irritation, vomiting and/or defecation.

Treatment:

Decontamination:

Patients whose skin or clothing is contaminated must have clothing removed and be decontaminated with soap and water.

Supportive Care:

There is no specific antidotal therapy for MIC poisoning. Treatment is basic supportive care.

METHYL BROMIDE

(Bromomethane, monobromomethane, isobrome and methyl fume)

Signs/symptoms:

Methyl bromide methylates the sulfhydryl groups of enzymes, causing disruption at the cellular level. It is primarily a neurotoxic gas.

1) Skin: High concentrations may cause erythema, pain and blisters. *Children are more vulnerable.*
2) HEENT: Mucosal irritation and burns of eyes, mouth and nose.
3) GI: Nausea, vomiting and diarrhea. Elevated liver enzymes.
4) Renal: Transient renal insufficiency.
5) Pulmonary: Upper respiratory tract irritation, cough and chest tightness *Children may be more vulnerable.*
6) Cardiovascular: Tachycardia and hypotension.
7) CNS: Dizziness, headache, confusion, lethargy, seizures and coma.

Treatment:

Decontamination:

Exposed only to methyl bromide gas pose no risk, need only removal of clothing. Patients whose skin or clothing is contaminated must have clothing removed and be decontaminated with soap and water.

Supportive Care:

There is no specific antidotal therapy for methyl bromide poisoning. The cornerstone of treatment is basic supportive care.

Antidotal Therapy:

Antidotal therapy, especially pralidoxime (2-PAM), should be started as soon after exposure as possible to prevent irreversible binding to the acetylcholinesterase enzyme.

1) Mark Kits: Each kit contains 600 mg of 2-PAM and 2 mg of atropine
   a) Initial bolus:
      a. One Mark 1 kit for mild symptoms such as ambulating, miosis, eye pain, blurred vision, rhinorrhea, mild dyspnea, sweating at exposure site-if dermal exposure
      b. Two Mark 1 kits for moderate symptoms such as unable to ambulate, nausea, vomiting, wheezing, dyspnea or large scale fasciculations
      c. Three Mark 1 kits for severe symptoms such as extremis, loss of consciousness, flaccid paralysis, seizures, cardiac or respiratory arrest
   b) Maintenance: 1 Mark kit injection every hour for three hour

If Mark kits are unavailable or IV access has been obtained:

1) **Atropine**

   Adults: 1-2 mg IV. Repeat every 5 minutes until secretions have cleared.

   Pediatrics: 0.05 mg/kg IV. Repeat every 5 minutes until secretions have cleared.

2) **Pralidoxime (2-PAM)**

   Adults: *Loading Dose:* 1-2 gm diluted in 100-150 cc NS infused over 30 minutes.
   Maintenance Infusion: Up to 500 mg per hour (maximum of 12 gm/day)

   Pediatrics: *Loading Dose:* 25-40 mg/kg (maximum one gram) as a 5% solution in NS infused over 30 minutes. *Maintenance Infusion:* 10-20 mg/kg/hr of a 5% solution in NS

(see next page)

NERVE AGENTS

(e.g., Sarin, Soman, Tabun, VX)

Incubation Period:

1) Vapor or gas exposure: Seconds to minutes
2) Dermal liquid exposure: Minutes to hours

Signs/Symptoms:

1) Motor: Ranges from diffuse muscle cramping and fasciculations (early) to flaccid paralysis (late).
2) Pulmonary: Rales, wheezing, poor inspiration from muscle weakness.
3) Cardiac: Bradycardia or tachycardia, and hypotension or hypertension.
4) GI: Nausea, vomiting, diarrhea, abdominal cramping.
5) GU: Urinary incontinence.
6) Skin: Diaphoresis.
7) HEENT: Miosis or rarely mydriasis, tearing of eyes, excessive salivation.
8) CNS: Confusion, agitation, seizures, coma.

Treatment:

Decontamination:

1) Dermal exposure: Remove all clothes and jewelry. Wash patient with copious amounts of mild soap or bleach and water as per hospital guidelines. *Soap and water may be preferable for infants and small children*. Use chemical resistant gloves.
2) Ingestion: Lavage and charcoal.

(over)

Supportive Care:

1) Seizures:

a) Diazepam

Adults: 5-10 mg IV, repeat every 5 to 10 minutes prn. Consider a second agent if seizures persist or recur after 30 mg have been administered.

Pediatrics: 0.2 - 0.5 mg/kg IV, repeat every 5 to 10 minutes prn. Consider a second agent if seizures persist or recur after diazepam 10 mg in children over 5 years, or 5 mg in children under 5 years of age.

b) Lorazepam

Adults: 2 - 4 mg IV/IM, repeat every 5 to 10 minutes if seizures persist
Pediatrics: 0.05 - 0.1 mg/kg IV/IM. (Maximum four mg/dose), repeat every 5 to 10 minutes prn

c) Phenobarbital

Adults: *Loading dose:* 600 -1200 mg phenobarbital IV (10-20 mg/kg) diluted in NS. Infuse at 25-50 mg per minute. *Maintenance dose:* Additional doses of 120 - 240 mg may be given every 20 minutes.

Pediatrics: *Loading dose:* 15-20 mg/kg of phenobarbital, IV infusion at a rate of 25-50 milligrams per minute. *Maintenance Dose:* Repeat doses of 5-10 mg/kg may be given every 20 minutes.

2) Airway: Support airway with standard measures.

3) Hypotension: Standard supportive measures.

PHOSGENE

Background:

Phosgene is used as a chemical intermediate in the manufacture of chemicals such as isocyanates, polyurethane, polycarbonates, dyes, pesticides and pharmaceuticals. It also is a by-product of burning or heating most volatile chlorinated compounds such as Freon, certain solvents, dry-cleaning agents and paint removers.

Signs/Symptoms:

1) Airway: May have mild irritation if a large exposure has occurred. Phosgene exerts most of its damage in the lower respiratory tree.
2) Pulmonary: Asymptomatic initially; 30 minutes to 72 hours later, patients may develop respiratory problems such as cough, dyspnea, tachypnea progressing to pulmonary edema and ARDS.
3) Cardiovascular: Instability caused by hypoxia and respiratory collapse.
4) Dermal: If the skin is wet or moist, may develop irritation and erythema.
5) Eyes: Tearing and irritation not uncommon; opacification of the cornea may occur in rare instances.
6) GI: Hepatic and/or renal necrosis from direct phosgene effects on end organs. Nausea and vomiting may be seen post exposure.

Treatment:

1) Decontamination:
    a) Fluid exposure will need dermal decontamination.
    b) For symptomatic ocular exposures, flush eyes for 15 minutes.
2) Treat bronchospasm with bronchdilators.
3) Consider steroids for treatment of pulmonary damage.
4) Consider racemic epinephrine for pediatric patients with stridor.

Respiratory Contact

These agents may be spread from person to person by respiratory contact (e.g., sneezing or coughing).

- **Plague**
  Yersinia pestis
- **Smallpox**
  Variola major
- **Viral Hemorrhagic Fever**
- **Glanders**
  Burkholderia mallei

Food

These agents can potentially be spread through a food source (ingestion). Many agents are killed by heat and therefore proper cooking measures can help to prevent disease through this route.

- **Anthrax**
  Bacillus anthracis
- **Botulism**
  Clostridium botulinum toxin
- **Tularemia**
  Francisella tularensis
- **Brucellosis**
  Brucella spp.
- **Toxins**
  Clostridium perfringens
  Ricinus communis
  Staph. aureus
- **Food Safety**
  Salmonella spp.
  E. coli O157:H7
  Campylobacter spp.

Water

These agents can potentially be spread through a water source. This includes contact with contaminated water (e.g., open wounds) as well as drinking contaminated water.

- **Melioidosis**
  Burkholderia pseudomallei
- **Tularemia**
  Francisella tularensis
- **Toxins**
  Clostridium perfringens
  Ricinus communis
  Staph. aureus
- **Brucellosis**
  Brucella spp.
- **Water Safety**
  Cryptosporidium parvum
  Vibrio cholerae

Note: Bioterrorism pathogens may have atypical routes of transmission and clinical manifestations. The agents are listed by currently known means of transmission. Much is still to be learned about many of the agents so other routes may be possible.

Transmission Routes of Potential Bioterrorism Agents

Inhalational

These agents can be transmitted through the air. It is thought that a bioterrorist attack will most likely involve inhalational exposure.

- **Anthrax**
  Bacillus anthracis
- **Botulism**
  Clostridium botulinum toxin
- **Plague**
  Yersinia pestis
- **Tularemia**
  Francisella tularensis
- **Brucellosis**
  Brucella spp.
- **Glanders**
  Burkholderia mallei
- **Melioidosis**
  Burkholderia psuedomallei
- **Psittacosis**
  Chlamydophila psittaci
- **Q Fever**
  Coxiella burnettii
- **Toxins**
  Clostridium perfringens
  Ricinus communis
  Staph. aureus

Vector

These agents can be transmitted by an arthropod vector.

- **Fleas**
  - **Plague**
    Yersinia pestis
- **Lice**
  - **Typhus**
    Rickettsia prowazekii
- **Ticks**
  - **Tularemia**
    Francisella tularensis
  - **Q Fever**
    Coxiella burnettii
- **Mosquitoes**
  - **Tularemia**
    Francisella tularensis
  - **Viral encephalitis**
    VEE, EEE, WEE
  - **West Nile Fever virus**
  - **Rift Valley Fever virus**

Direct Contact

These agents can be acquired by directly touching a person or animal or by contact with fluids (urine, feces, vomit, saliva) or tissues from an infected person or animal.

- **Anthrax**
  Bacillus anthracis
- **Plague**
  Yersinia pestis
- **Smallpox**
  Variola major
- **Tularemia**
  Francisella tularensis
- **Brucellosis**
  Brucella spp.
- **Glanders**
  Burkholderia mallei
- **Melioidosis**
  Burkholderia psuedomallei
- **Q Fever**
  Coxiella burnettii
- **Nipah Virus**
- **Hendra Virus**
- **Rift Valley Fever**
  Phlebovirus