Selected Biological Agent Characteristics

Agent Type	Disease/Condition *Causative Agent/ Pathogen*	Description of Agent	Transmissible Person to Person	Infectivity/ Lethality	Incubation Period	Duration of Illness	Persistence/ Stability	Vaccination/ Toxoids	Rate of Action	Symptoms	Treatment	Possible Means of Delivery
BACTERIA	Anthrax (inhalation) *Bacillus anthracis*	Rod-shaped, gram-positive, aerobic sporulating micro-organism, individual spores ~(1–1.2)x(3–5)µm	No	Moderate/ High	1–7 days	3–5 days	Spores are highly stable	Yes	Symptoms in 2–3 days; Shock and death occurs with 24–36 hrs after symptoms	Fever, malaise, fatigue, cough and mild chest discomfort, followed by severe respiratory distress with dyspnea, diaphoresis, stridor, and cyanosis	Usually not effective after symptoms are present, high dose antibiotic treatment with penicillin, ciprofloxacin, or doxycycline should be undertaken. Supportive therapy may be necessary.	Aerosol.
	Brucellosis *Brucella suis, melitensis & abortus*	All non-motile, non-sporulating, gram negative, aerobic bacterium; ~(0.5-1)x(1-2)µm	No	High/Low	Days to months	Weeks to months	Organisms are stable for several weeks in wet soil and food.	Yes	Highly variable, usually 6-60 days.	Chills, sweats, headache, fatigue, myalgias, arthralgias, and anorexia. Cough may occur. Complications include sacroiliitis, arthritis, vertebral osteomyelitis, epididymoorchitis, and rarely endocarditis.	Recommended treatment is doxycycline (200 mg/day) plus rifampin (900 mg/day) for 6 weeks.	Aerosol. Expected to mimic a natural disease.
	Cholera *Vibrio cholerae*	Short, curved, motile, gram-negative, non-sporulating rod. Strongly anaerobic, these organisms prefer alkaline and high salt environments.	Negl.	Low/Mode rate-High	1-5 days	1 or more weeks	Unstable in aerosols and pure water, more so in polluted water.	Yes	Sudden onset after 1-5 day incubation period.	Initial vomiting and abdominal distension with little or no fever or abdominal pain. Followed rapidly by diarrhea, which may be either mild or profuse and watery, with fluid losses exceeding 5 to 10 liters or more per day. Without treatment, death may result from severe dehydration, hypovolemia, and shock.	Therapy consists of fluid and electrolyte replacement. Antibiotics will shorten the duration of diarrhea and thereby reduce fluid losses. Tetracycline, ampicillin, or trimethoprim-sulfamethoxazole are most commonly used.	1. Sabotage (food/water supply) 2. Aerosol
	Glanders *Burkholderia mallei*	Gram-negative bacillus primarily noted for producing disease in horses, mules, and donkeys	Negl.	/Moderate-High	10-14 days	N/A	N/A	No	N/A	Inhalational exposure produces fever, rigors, sweats, myalgia, headache, pleuritic chest pain, cervical adenopathy, splenomegaly, and generalized papular/pustular eruptions. Almost always fatal without treatment.	Few antibiotics have been evaluated *in vivo*. Sulfadiazine may be effective in some cases. Ciprofloxacin, doxycycline, and rifampin have *in vitro* efficacy. Extrapolating from melioidosis guidelines, a combination of TMP-SMX + ceftazidime ± gentamicin might be considered.	Aerosol.
	Plague (pneumonic, bubonic) *Yersinia pestis*	Rod-shaped, non-motile, non-sporulating, gram-negative, aerobic bacterium; ~(0.5-1)x(1-2)µm	High	High/Very High in untreated personnel, the mortality is 100%	2 to 6 days for bubonic and 3 to 4 days for pneumonic	1-2 days	Less important because of high transmissibility.	Yes	Two to three days	High fever, chills, headache, hemoptysis, and toxemia, progressing rapidly to dyspnea, sturdier, and cyanosis. Death results from respiratory failure, circulatory collapse, and a bleeding diathesis.	Early administration of antibiotics is very effective. Supportive therapy for pneumonic and septicemic forms is required.	May be delivered via contaminated vectors (fleas) causing bubonic type, or, more likely, via aerosol causing pneumonic type.
	Shigellosis *Shigella Dysenteriae*	Rod-shaped, gram-negative, non-motile, non-sporulating bacterium	Negl.	High/Low	1-7 days (usually 2-3)	N/A	Unstable in aerosols and pure water, more so in polluted water.	No	Symptoms usually within 2-3 days, however, known to demonstrate in as little as 12 hours or as long as 7 days.	Fever, nausea, vomiting, abdominal cramps, watery diarrhea, and occasionally, traces of blood in the feces. Symptoms range from mild to severe with some infected individuals not experiencing any symptoms.	The antibiotics commonly used for treatment are ampicillin, trimethoprim/sulfamethoxazole (also known as Bactrim* or Septra*), nalidixic acid, or ciprofloxacin. Persons with mild infections will usually recover quickly without antibiotic treatment. Antidiarrheal agents such as loperamide (Imodium*) or diphenoxylate with atropine (Lomotil*) are likely to make the illness worse and should be avoided.	Contaminated food or water
	Tularemia *Francisella tularensis*	Small, aerobic, non-sporulating, non-motile, gram-negative *cocco-bacillus* ~0.2x(0.2-0.7)µm	No	High/ Moderate if untreated	1-10 days	2 or more weeks	Not very stable	Yes	Three to five days	Ulceroglandular tularemia with local ulcer and regional lymphadenopathy, fever, chills, headache, and malaise. Typhoidal or septicemic tularemia presents with fever, headache, malaise, substernal discomfort, prostration, weight loss, and non-productive cough.	Administration of anitbiotics with early treatment is very effective. Streptomycin – 1 gm I. M. q. 12 hrs x 10 10-14 d. Gentamicin – 3-5 mg/kg/day x 10-14 d.	Aerosol.
	Typhoid *Salmonella typhi*	Rod-shaped, motile, non-sporulating gram-negative bacterium	Negl.	Moderate/ Moderate if untreated	6-21 days	Several weeks	Stable	Yes	One to three days	Sustained fever, severe headache, malaise, anorexia, a relative bradycardia, splenomegaly, nonproductive cough in the early stage of the illness, and constipation more commonly than diarrhea.	Chloramphenicol amoxicillin or TMP-SMX. Quilone derivatives and third generation cephalusporins and supportive therapy.	Sabotage of food and water supplies.
RICKETTSIAE	Q-Fever *Coxiella burneti*	Bacterium-like, gram-negative organism, pleomorphic 300-700 nm	No	High/Very low	10-20	2 days to 2 weeks	Stable	Yes	Onset may be sudden	Chills, retrobulbar headache, weakness, malaise and severe sweats.	Tetracycline or doxycycline are the treatment of choice and are given orally for 5 to 7 days.	May be a dust cloud either from a line source or a point source (downwind one-half mile or more).
	Typhus (classic) *Rickettsia prowazeki*	Non-motile, minute, coccoid or rod shaped rickettsiae, in pairs or chains, 300 nm	No	High/High	6-15 days	Weeks to months	Not very stable	No	Variable onset, often sudden. Terminates by rapid lysis after about 2 weeks of fever	Headache, chills, prostration, fever, and general pain. A macular eruption appears on the fifth to sixth day, initially on the upper trunk, followed by spread to the entire body, but usually not the face, palms, or soles.	Tetracyclines or chlormphenical orally in a loading dose of 2-3 g, followed by daily doses of 1-2 g/day in 4 divided doses until ind. becomes afelorite (usually 2 days) plus 1 day.	May be delivered via contaminated vectors (lice or fleas).
VIRUSES	Encephalitis	Lipid-enveloped virions of 50-60 nm dia., icosohedral nucleocapsid w. 2 glycoproteins										
	-Eastern/Western Equine Encephalitis (EEE, WEE)		Negl.	High/High	5-15 days	1-3 weeks	Relatively unstable	Yes		Inflammation of the mengies of the brain, headache, fever, dizziness, drowsiness or stupor, tremors or convulsions, muscular incoordination.	No specific treatment; supportive treatment is essential	Airborne spread possible.
	-Venezuelan Equine Encephalitis		Low	High/Low	1-5 days	Days to weeks	Relatively unstable	Yes	Sudden	Inflammation of the mengies of the brain, headache, fever, dizziness, drowsiness or stupor, tremors or convulsions, muscular incoordination.	No specific treatment; supportive treatment is essential	Airborne spread possible.
	Hemorrhagic Fever									Malaise, myalgias, headache, vomiting, and diarrhea may occur with any of the hemorrhagic fevers	No specific treatment; intensive supportive treatment is essential	Airborne spread possible.
	-Ebola Fever	Filovirus	Moderate	High/High	7-9 days	5-16 days	Relatively unstable	No		May also include a macular dermatologic eruption.		
	-Marburg	Filovirus	Moderate					No		May also include a macular dermatologic eruption.		
	-Yellow Fever	Flavivirus. Isosahedral nucleocapsid 37-50 nm diam., lipoprotein env. w/ short surface spikes	Negl.	High/High	3-6 days	1-2 weeks	Relatively unstable	Yes	Sudden			
	Variola Virus (Smallpox)	Asymmetric, brick-shaped, rounded corners; DNA virus	High	High/High	7-17 days	1-2 weeks	Stable	Yes	2-4 days	Malaise, fever, rigors, vomiting, headache, and backache. 2-3 days later lesions appear which quickly progress from macules to papules, and eventually to pustular vesicles. They are more abundant on the extremities and face, and develop synchronously.	No specific treatment; supportive treatment is essential	Airborne spread possible.
TOXIN	Botulinum Toxin	any of the seven distinct neurotoxins produced by the bacillus, *Clostridium botulinum*	No	NA/High	Variable (hours to days)	24-72 hours/Months if lethal	Stable	Yes	12-72 hours	Initial signs and symptoms include ptosis, generalized weakness, lassitude, and dizziness. Diminished salivation with extreme dryness of the mouth and throat may cause complaints of a sore throat. Urinary retention or ileus may also occur. Motor symptoms usually are present early in the disease; cranial nerves are affected first with blurred vision, diplopia, ptosis, and photophobia. Bulbar nerve dysfunction causes dysarthria, dysphonia, and dysphagia. This is followed by a symmetrical, descending, progressive weakness of the extremities along with weakness of the respiratory muscles. Development of respiratory failure may be abrupt.	(1) Respiratory failure—tracheostomy and ventilatory assistance, fatalities should be <5%. Intensive and prolonged nursing care may be required for recovery (which may take several weeks or even months). (2) Food-borne botulism and aerosol exposure—equine antitoxin is probably helpful, sometimes even after onset of signs of intoxication. Administration of antitoxin is reasonable if disease has not progressed to a stable state. Use requires pretesting for sensitivity to horse serum (and desensitization for those allergic). Disadvantages include rapid clearance by immune elimination, as well as a theoretical risk of serum sickness.	1. Sabotage (food/water supply) 2. Aerosol
	Ricin	Glycoprotein toxin (66,000 daltons) from the seed of the castor plant	No	NA/High	Hours	Days	Stable	Not effective	6-72 hours	Rapid onset of nausea, vomiting, abdominal cramps and severe diarrhea with vascular collapse; death has occurred on the third day or later. Following inhalation, one might expect nonspecific symptoms of weakness, fever, cough, and hypothermia followed by hypotension and cardiovascular collapse.	Management is supportive and should include maintenance of intravascular volume. Standard management for poison ingestion should be employed if intoxication is by the oral route.	Aerosol
	Staphylococcal enterotoxin B	One of several exotoxins produced by *Staphylococcus aureus*	No	NA/Low	Days to weeks	Days to weeks	Stable	Not effective	30 min-6 hours	Fever, chills, headache, myalgia, and nonproductive cough. In more severe cases, dyspnea and retrosternal chest pain may also be present. In many patients nausea, vomiting, and diarrhea will also occur.	Treatment is limited to supportive care. No specific antitoxin for human use is available.	1. Sabotage (food/water supply) 2. Aerosol
	Trichothecene (T-2) Mycotoxins	A diverse group of more than 40 compounds produced by fungi.	No	NA/High	Hours	Hours	Stable	Not effective	Sudden	Victims are reported to have suffered painful skin lesions, lightheadedness, dyspnea, and a rapid onset of hemorrhage, incapacitation and death. Survivors developed a radiation-like sickness including fever, nausea, vomiting, diarrhea, leukopenia, bleeding, and sepsis.	General supportive measures are used to alleviate acute T-2 toxicoses. Prompt (within 5-60 min of exposure) soap and water wash significantly reduces the development of the localized destructive, cutaneous effects of the toxin. After oral exposure management should include standard therapy for poison ingestion.	1. Sabotage 2. Aerosol