NEWS & TERRORISM
COMMUNICATING IN A CRISIS

A fact sheet from the National Academies and the U.S.Department of Homeland Security

"Communication before, during and after a biological attack will be a critical element in effectively responding to the crisis and helping people to protect themselves and recover."

–A Journalist's Guide to Covering Bioterrorism (Radio and Television News Director's Foundation, 2004)

BIOLOGICAL ATTACK
HUMAN PATHOGENS, BIOTOXINS, AND AGRICULTURAL THREATS

WHAT IS IT?

A biological attack is the intentional release of a pathogen (disease-causing agent) or biotoxin (poisonous substance produced by a living organism) against humans, plants, or animals. An attack against people could be used to cause illness, death, fear, societal disruption, and economic damage. An attack on agricultural plants and animals would be used primarily to cause economic damage. It is useful to distinguish between two kinds of biological attack agents:

1. Transmissible agents that spread from person to person or animal to animal (e.g., smallpox, foot and mouth disease, Ebola).
2. Agents that may cause adverse effects in exposed individuals but generally do not spread beyond the point of release (e.g., anthrax, botulinum toxin).

Availability of Agents

The Centers for Disease Control and Prevention (CDC) lists the biothreat agents considered to pose the highest threat (see Table 1). These agents could be:

- **Gathered from sources in nature.** The threats in Table 1 are either biotoxins or zoonotic diseases (that occur in wildlife and are transmissible to humans)—except smallpox, which has been eradicated from the wild.
- **Acquired from laboratories or bioweapons stockpile.** Smallpox is officially studied in only two laboratories in the world. Anthrax is widely studied in labs. Hemorrhagic fever viruses are studied only in limited high-security locations. Most high threat agents had been studied in bioweapons programs outside the United States until as recently as the 1990s and had been stockpiled.
- **Synthesized or genetically manipulated in a laboratory.** This would require expertise and access to advanced technology.

How Biological Agents Could Be Disseminated

For an attack on people, biological agents could be disseminated by the following methods:

- **Aerosol dissemination** is the dispersal of an agent in air from sprayers or other devices. The agent must be cultured and processed to the proper size to maximize human infections, while maintaining the agent's stability and pathogenicity (ability to produce illness). An aerosol attack might take place outdoors in a populated area or indoors, e.g., in the ventilation system of a building, in the subway, on planes. It takes expertise to process biological agents to *maximize* the effect of aerosol dissemination, but even relatively crude devices could have an impact.
- **Human carriers** could spread transmissible agents by coughing, through body fluids, or by contaminating surfaces. Most agents would make a person ill or incapacitated before they become highly contagious, thereby reducing transmission of the disease.
- **Food or water,** especially ready-to-eat food (vegetables, salad bars) could be intentionally contaminated with pathogens or toxins. The water supply is less vulnerable because chlorination can kill most disease-causing organisms.
- **Insects naturally spread some agents such** as plague and yellow fever virus (vector borne illnesses) and could potentially be used in an attack.
- **Infected animals** can cause people to become ill through contact with the animals or contaminated animal products.

For an agricultural attack:

- **A point introduction** of an infected plant or animal or its fluids could spread disease through the rest of the crop or livestock. Agricultural biothreat agents (e.g. foot and mouth disease (FMD), avian influenza, soy bean rust, and karnal bunt of wheat) do not have to be aerosolized to be effectively disseminated.

***TABLE 1.* Diseases/Agents Listed by the CDC as Potential Bioterror Threats. The U.S. Department of Agriculture maintains lists of animal and plant agents of concern.**

Category A: Easily disseminated and/or contagious; high mortality rates; might disrupt society; requires special action for public health preparedness.

Bacteria (single-celled organisms):
- Anthrax *(Bacillus anthracis)*
- Plague *(Yersinia pestis)*
- Tularemia *(Francisella tularensis)*

Viruses (DNA or RNA requiring other cells to replicate):
- Smallpox (Variola major virus)
- Viral Hemorrhagic Fever: Ebola, Marburg, Lassa, Machupo (various classes of viruses)

Biotoxins (poisonous substances produced by living organisms):
- Botulism *(Clostridium botulinum toxin)*

CATEGORY B: Moderately easy to disseminate; moderate illness rates, low mortality; requires enhanced diagnostic capacity, surveillance.

Bacteria:
- Brucellosis *(Brucella species)*
- Glanders *(Burkholderia mallei)*
- Melioidosis *(Burkholderia pseudomallei)*
- Psittacosis *(Chlamydia psittaci)*
- Food safety threats (e.g., *Salmonella* species, *Escherichia coli* 0157:H7, *Shigella*)
- Water safety threats (e.g., *Vibrio cholerae, Cryptosporidium parvum*)

Viruses:
- Viral encephalitis (Alphaviruses)

Rikettsia (micro-organisms that live in cells):
- Q fever *(Coxiella burnetii)*
- Typhus fever *(Rickettsia prowazekii)*

Biotoxins:
- Epsilon toxin of *Clostridium perfringens*
- Ricin toxin from castor beans
- Staphylococcal enterotoxin B

CATEGORY C: Emerging infectious diseases that could be a future threat

Nipah virus and Hantavirus

IMPACT FOLLOWING THE RELEASE OF A PATHOGEN

Detection of a Biological Attack

Unlike a chemical or nuclear attack, a biological attack may go undetected for hours, days, or potentially weeks (depending on the agent) until people, animals, or plants show symptoms of disease. If there are no immediate signs of the attack as with the anthrax letters, a biological attack will probably first be detected by local health care workers observing a pattern of unusual illness or by early warning monitoring systems that detect airborne pathogens. Evidence of an attack may appear in animals before humans. Various surveillance systems for detecting human and animal diseases are also in place, although they are not foolproof.

The Area Affected

The area affected would depend on the form and quantity of agent released, whether the release is indoors or outdoors, and weather conditions. Agents released outdoors would disperse roughly in the direction of the prevailing wind and could degrade with sunlight and by drying out from environmental exposure. Agents released indoors could initially have a higher concentration. Sometimes agents can be re-aerosolized from foot traffic.

Finding the Cause and Source of Illness

There may be uncertainties about crucial facts such as the exact location or extent of the initial release, the type of biological agent used, and likelihood of additional releases. Epidemiologists will trace the path of infections back toward a single person, vector (insect or animal), or point of origin. Laboratory scientists will work quickly to identify the specific agent using laboratory methods. Attribution of a biological attack is typically much more difficult than attribution of a conventional terrorist attack.

Dose Response in Humans

The exact infectious dose (the number or organisms needed to make one sick) of most biological agents is unknown; approximate doses are extrapolated from animal studies. Whether a person becomes ill after exposure to a biological agent depends on a number of factors including:

- Type and amount of agent taken into the body
- Duration of exposure
- Route of exposure (inhalation, ingestion, insect bite)
- "Host" factors (e.g., age, immune status, other illnesses of the person exposed)

Historical Perspective on Biological Attack

- In 2001, five died, eleven were infected by anthrax attacks through the U.S. mail.
- In the 1990s, the cult Aum Shinrikyo failed in attempts to release anthrax and botulinum toxin in Tokyo, but did succeed in a chemical attack with Sarin nerve agent.
- In 1984, the cult Baghwan Shree Rajneesh sickened 751 people in Oregon by placing salmonella bacteria in a salad bar to keep people from voting in an election.
- In World War II, Unit 731 in Japanese-occupied Manchuria dropped plague-infected fleas in China, allegedly resulting in more than 50,000 deaths.
- In World War I, German agents successfully infected Allied livestock with anthrax and glanders.
- In the 1340s, Europeans threw plague-infected cadavers over city walls to infect those within.

Laws and Treaties Governing Biological Weapons

- The Geneva Convention of 1925 was the first international agreement to address chemical and biological weapons. It prohibits "bacteriological methods of warfare," but did not outlaw the development of such weapons.
- The Biological and Toxins Weapons Convention (BWC) of 1972 is the first arms control treaty to outlaw an entire class of weapons and forbids States from developing, producing, stockpiling or retaining biological weapons or assisting other States in developing these weapons systems.
- The Australia Group is a loose association of nations that agrees not to export tools and technologies, including pathogens, that have "dual uses"—that is, they can be used for both legitimate and nefarious purposes.

TABLE 2. **ONSET, HEALTH IMPACTS, AND TREATMENTS FOR SOME AGENTS OF CONCERN**

Disease (agent)	**Incubation period***	**Symptoms**
HIGH THREAT AGENTS (CATEGORY A)		
Anthrax (Bacillus anthracis)	1-6 days	Fever, cough, respiratory distress
Plague (Yersinia pestis)	1-7 days (usually 2-3 days)	Fever, cough shortness of breath, sore lymph nods (bubonic)
Tularemia (Francisella tularensis)	1-21 days (avg 3-6)	Fever, cough, pneumonia, headache
Viral hemorrhagic fever (Marburg)	4-21 days	Sudden onset, fever, headache, sore throat, followed by vomiting and diarrhea, rash, generalized bleeding
Viral hemorrhagic fever (Ebola)	4-21 days	Sudden onset, fever, headache, sore throat, followed by vomiting and diarrhea, rash, generalized bleeding
Smallpox (Variola major virus)	7-17 days (avg 12)	Fever, aches, after 2-4 days rash appears
Botulism (Clostridium botulinum toxin)	12 hours – 5 days	Muscle paralyzing illness
LOWER THREAT AGENTS (SELECTED CATEGORY B AGENTS)		
Cholera (*Vibrio cholerae*)	4 hours–5 day (usually 2-3 days)	Sudden onset of voluminous watery diarrhea, vomiting, cramps, dehydration
Glanders (Burkholderia mallei)	10-14 days via aerosol	Fever, cough, ulcers in nose, mouth, throat and lungs, blood poisoning
Q fever (*Coxiella burnetii*)	7-41 days	Flu-like illness that can lead to pneumonia and hepatitis
Encephalitis (Alphaviruses)	2-6 days	Fever, aches, pain behind the eye, nausea, vomiting
Ricin Toxin	18-24 hours	Poison that can shut down organ function

** Incubation periods for naturally occurring outbreaks, which could differ for agents used as weapons. Data for incubation period, lethality, and persistency from*

Contagiousness of Diseases

Transmissible diseases spread in a variety of ways including respiratory droplets from coughing and sneezing, or when a person comes in contact with a surface harboring a virus or bacterium and then touches their mouth or nose. Some diseases are spread by direct contact with body fluids or feces. Individuals infected with contagious diseases may widely disseminate the disease by travel.

Infectious Is Different Than Contagious

The terms "infectious" and "contagious" are often confused. Infectious refers to the number of particles (spores or organisms) needed to infect an individual. The fewer number of particles needed, the more infectious the agent. Some agents that are highly infectious, such as Tularemia and Q fever, are not contagious.

WHAT IS THE DANGER?

Impact on human health

For many biological agents, the primary symptom is a flu-like illness. Although the initial symptoms of many agents may be nonspecific and indistinguishable from common illnesses, the ultimate result may be life threatening illness. Even though ranges for the incubation period (time to onset of illness) have been established for biothreat agents, the behavior of agents when used as weapons could differ from naturally occurring outbreaks.

Psychological Impacts

Psychological responses following a bioterrorism event may include anger, fear, and social isolation. Following the 2001 anthrax attacks, thousands of people who thought they were infected sought treatment. Trying to distinguish those who haven't been infected could complicate medical centers' ability to treat those who have been exposed and infected, especially when diagnoses are unclear. The level of public concern may be impacted by effectiveness of communications from officials and the news media.

WHAT SHOULD PEOPLE DO TO PROTECT THEMSELVES?

During a declared biological emergency:

1. If a family member becomes ill, it is important to monitor the person. Understand, however, that symptoms of many common illnesses overlap.
2. If you are in the group or area that authorities have linked to exposure and your symptoms match those described, seek emergency medical attention.
3. Use common sense, practice good hygiene and cleniness to avoid spreading germs.

Spread (person to person)	**Lethality if untreated**	**Persistence of Organism**	**Vaccine Status**	**Medical Treatment**
No (except skin form)	High (if inhaled)	Very stable-spores viable in soil > 40 yrs	Licensed	Antibiotics
Moderate	High unless treated within 12-24 hours (pneumonic)	For up to 1 year in soil; 270 days in live tissue	Licensed	Antibiotics
No	Moderate	For months in moist soil or other media	Not current	Antibiotics
Via fluids	>25% lethal	Relatively unstable	Investigational	Supportive treatment only
Via fluids	50-80% lethal	Relatively unstable	None	Supportive treatment only
High	High to moderate >30% lethal	Very stable	Licensed	Supportive, vaccine
No	High without respiratory support	Stable for weeks in nonmoving food/water	Licensed	Antitoxin if administered quickly
Rare, although spreads rapidly via contaminated water	Low with treatment, high without	Unstable in aerosols & fresh water, stable in salt water	Investigational	Antibiotics
No	Death in 7-10 days in septicemic form	Very stable	None	Antibiotics
No	Very low	For months on wood and sand	Not licensed in U.S.	Antibiotics
Low	Low	Relatively unstable	None	Supportive treatment
No	High (injected)	Stable	Investigational	No antidote; supportive treatment

n U.S. Army Medical Research Institute of Infectious Diseases handbook, August 2004.

If you are potentially exposed:

1. Follow instructions of doctors and other public health officials.
2. If the disease is contagious expect to receive medical evaluation and treatment. You may be advised to stay away from others or even deliberately quarantined.

If you become aware of a suspicious substance nearby:

1. Quickly get away.
2. Cover your mouth and nose with layers of fabric or paper products that can filter the air but still allow breathing.
3. Wash with soap and water.
4. Contact authorities.
5. Watch TV, listen to the radio, or check the Internet for official news and information including what the signs and symptoms of the disease are, if medications or vaccinations are being distributed and where you should seek medical attention if you become sick.
6. If you become sick seek emergency medical attention.

Medical Treatment

Table 2 lists medical treatments for several biothreat agents. In general, bacterial illnesses are treated with antibiotics, and viral illnesses are treated with supportive care, although there are a few specific medications to treat viral infections. Biotoxins are treated with antidotes or antitoxins, if available. Vaccines can prevent or mitigate the effects of a disease, but must typically be given several weeks before exposure with some exceptions. The smallpox vaccine may provide protection even if given 1-4 days after exposure, and the anthrax vaccine can be given after inhalation exposure if accompanied by treatment with antibiotics for a number of weeks.

Controlling the Spread of Contagious Diseases

Methods to control contagious disease include isolation, quarantine, and barrier methods (gloves, filter masks, eye protection), and hand washing. Rapid identification of potentially infected persons increases the effectiveness of these methods.

LONG-TERM CONSEQUENCES

Monitoring and Clean-up

After a biological agent has been identified, offivials will take steps to characterize how long the agent will persist. Clean-up within buildings may entail the use of gas or liquid decontaminants to kill the agent. For example, chlorine dioxide gas was released through ventilation systems of buildings contaminated with anthrax. In some cases, multiple rounds of decontamination may be necessary to address safety concerns. Decisions regarding how much clean up is necessary will depend on:

- The amount of agent released.
- How far the agent has spread in the air.
- How the space will be used post clean-up.

Long-term Health Consequences

The long-term health consequences for those who survive exposure to biological attack agents are unknown.

Economic Impact of an Agricultural Attack

Once detected, an act of agricultural bioterrorism may quickly halt the movement and export of livestock or the affected crop, causing severe consequences for producers, shippers, and consumers.

ADDITIONAL RESOURCES

Centers for Disease Control and Prevention
http://www.bt.cdc.gov/index.asp

Department of Homeland Security
http://dhs.gov/dhspublic, http://www.ready.gov

Infectious Disease Society of America
http://www.niaid.nih.gov/biodefense/

National Institute of Allergy and Infectious Disease
http://www.idsociety.org

U.S. Army Medical Research Institute of Infectious Diseases
http://www.usamriid.army.mil

This report brief was prepared by the National Academy of Engineering and the National Research Council of the National Academies in cooperation with the Department of Homeland Security. For more information, contact Randy Atkins at 202-334-1508. *Making the Nation Safer*, and other National Academies reports related to this topic are available from the National Academies Press, 500 Fifth Street, NW, Washington, DC 20001; 800-624-6242; *www.nap.edu.*

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