TERRORISM AND OTHER PUBLIC HEALTH EMERGENCIES

A Reference Guide for Media

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

A Message from the Office of the Assistant Secretary for Public Affairs
U.S. Department of Health and Human Services

The U.S. Department of Health and Human Services (HHS) created this guide to provide information for media professionals throughout the nation. An abbreviated version of the most essential information from this guide is available in "Terrorism and Other Public Health Emergencies: A Field Guide for Media," a compact guide designed to fit in a glove compartment, briefcase, or purse.

Both publications are available online at http://www.hhs.gov/emergency. The Office of the Assistant Secretary for Public Affairs at HHS will keep the online versions updated with new information on agents, treatments, new learning, and any evolutions in the organization of public health emergency response. We urge you to refer to the Web versions for the latest information.

You can order a copy of this guide or the field guide by calling (240) 629-3161 or online at http://www.hhs.gov/emergency. If you have any questions or comments about the guide itself, please contact the HHS Public Affairs Office at (202) 690-6343.

Please note: *All Web sites were checked and available during the final editing (September 2005) of this manual.*

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OFFICE OF THE ASSISTANT SECRETARY FOR PUBLIC AFFAIRS
U.S. Department of Health and Human Services • Washington, D.C.

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CONTENTS

The information in this guide is a result of the best knowledge available at the time of publication. In the sections describing terrorist agents, an effort has been made to identify issues that are not yet understood or where disagreement exists among experts. We urge you to refer to the Web version of this guide at http://www.hhs.gov/emergency for the latest information.

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INTRODUCTION

INTRODUCTION

This guide is for the people who write the words, who take the pictures, and who tell the stories about the events in our world—both ordinary and extraordinary. It is intended to provide information about how the public health system is preparing for and will respond to previously unthinkable events, such as September 11. More specifically, the guide's intent is to offer the best possible information about the worst-case scenarios.

The efforts of public health agencies at the federal, state, and local levels to prepare for what could happen in the future are largely invisible until there is an emerging threat, such as the recent SARS outbreak, or a dramatic event, such as the anthrax attacks of 2001. Through this effort, the U.S. Department of Health and Human Services (HHS) intends to provide the best available and most essential up-to-date health-related facts and background information that will be needed in the event of a terrorist attack or public health emergency. In addition, HHS hopes to reveal the commitment and often hidden complexity of the public health domain to news people who live in the world of here and now. The goal of this guide is not to tell you how to report or what to think but to serve as a resource at the time of an event and to provide guidance about what may be some of the most important stories ever written.

As ambitious as this enterprise is, it has limits. No one volume can contain everything the media need to know about reporting on terrorism and public health emergencies. While this guide is the product of some of the best available expertise inside and, in some cases, outside of the government, no one would claim this is the final word on the subject. It is a work in progress and will be updated online as new information becomes available.

Some may look at this volume skeptically as the product of a government agency with an agenda or a bureaucratic mindset. Others may view this guide for reporting on possible apocalyptic events as advancing a kind of doomsday mentality. The intention is neither.

The intention is to meet the need for credible source material on terrorism and other very real public health threats. The reports and images that would shape people's view of a possible terror attack or other health crisis would have an extraordinary impact not only on the readers, listeners, and viewers but also the writers of those stories. The burden is great for those who follow, or in some cases lead, first responders into the unknown and are then asked to emerge calmly with the facts.

While there is a difference between the roles of the public health professional and the journalist, there are also similarities. Both face dangers, both seek the truth, and both see communication as a primary goal. However, the intent here is not to merge these two disciplines or even suggest that one serve as a conduit for the other. Often, the media and government are adversaries due to the nature of their functions in society. Yet, the hope is that this guide will help to foster transparency and understanding between government health officials and journalists and to build a bridge that many will need to cross, if the time comes.

This tool will be most useful in the early phase of a terrorism event or major public health emergency but also has relevance for other public health events, such as disease outbreaks. It is not meant to supplant other works from either private or governmental sources but rather, to provide a different and complementary perspective. What is different here is that this guide assembles a wide variety of resources and filters them through the lens of public health action immediately following a major public health event. In addition to collecting extensive background information on possible terror weapons and agents, there is source material on how public health agencies and professionals function in an emergency.

There is also a chapter on the risk communication approach used by many public health officials. Communicating risk in the most responsible and accurate way during an emergency will be an ongoing challenge for the government—and the media. Here, the media and public health officials share the same goal—quickly providing the public with accurate information. Achieving this goal is critical to saving lives.

“Some say that this ‘new normal’ requires a new arrangement. They say the news media and government should pursue a ‘partnership’ to get the job done. That is neither practical nor wise. And it won’t happen. The news media have a job to do that requires them to stand aside. They should inform. They should investigate. They should hold responsible officials to account. To do this they must remain independent from those they cover, even against the grim backdrop of terrorism.

That is not to say, however, that there are not common interests and even common responsibilities.

JOURNALISTS AND GOVERNMENT OFFICIALS BOTH SERVE THE PUBLIC. BOTH NEED TO BE SURE THE INFORMATION THEY DISSEMINATE IS ACCURATE, CREDIBLE, TIMELY, AND RELEVANT. BOTH MUST KNOW THAT THEY WILL PAY A PRICE IF THEY FAIL TO DO THEIR JOBS WELL.”

Frank Sesno, university professor of public policy and communication at George Mason University and former Washington, D.C. bureau chief for CNN

Testimony before the House Select Committee on Homeland Security, September 2004

More than a year in the making, this guide has been extensively reviewed for accuracy by government scientists and experts in HHS and other federal agencies. Factually, the book represents the best current understanding of the problems as seen by HHS. In addition, several veteran journalists provided their insights and comments about what worked and what didn’t in the guide from a media perspective. Their input has been incorporated and responded to whenever possible.

Some of the key topics addressed in this work are:

- Information about the most likely biological, chemical, and radiological weapons that could be used by terrorists.
- Unanswered questions and conflicting opinions about certain terrorist agents.
- The emotional impact of disaster on the public and how that is likely to affect people’s reactions.
- How public health does its job in an emergency. For example, how does a disease detective track down the cause of an outbreak? When can quarantine be declared?
- What are the emotional consequences for journalists who spend a sustained period of time covering a disaster? What can be done to help reporters shield themselves from stress and other dangers that can affect their lives and their work?

This guide was written to be a helpful companion that can help inform your best work while trying to keep you safe. In every page of this book, there is that hope and that commitment.

REFERENCE

Sesno, F. (2004, September). *Covering terrorism: New challenges in a new era.* Testimony before the House Select Committee on Homeland Security.

PLANNING FOR THE UNTHINKABLE:
Preparation and Response in Public Health

02

PLANNING FOR THE UNTHINKABLE:
Preparation and Response in Public Health

Thousands of public health professionals work to promote health and prevent disease and disability across the nation in every community every day. Although this guide primarily focuses on the federal public health response to terrorism and other public health emergencies, understanding how public health works at the local and state levels is critical to understanding how a public health response to an emergency event will take place in a given community.

The backbone of the nation's public health system is at the local (typically county, township, or city) level. Providing low-cost health care services in communities is what many people think of when they hear the term "public health," but those services are only a small fraction of public health activities. Public health also includes the following functions, many of which are relevant to a public health emergency:

- Preventing and controlling epidemics and the spread of disease
- Protecting against environmental hazards
- Preventing injuries and disabilities
- Promoting and encouraging healthy behaviors (e.g., exercise, good nutrition) and mental health
- Responding to disasters and assisting communities in recovery
- Assuring the quality and accessibility of health services
- Ensuring safe and effective medical products
- Ensuring the safety of food, blood, and biologics (vaccines) (Harrell & Baker 2004)

In a terrorist attack, epidemic, natural disaster, or major accident, state and federal public officials provide help, but local public health is in the forefront during the first critical minutes and hours after a major incident has occurred. In addition, even after federal assistance arrives, the public health response will be implemented and managed locally. For example, decisions about where a mass vaccination clinic should be held would be made by local health officials. While many health departments were preparing for handling a major incident in their communities before September 11, the tragic events of that day focused new attention and resources on emergency preparedness and response.

This guide does not go into detail about how local and state health departments will function in a public health emergency because every state and locality does things differently. Although all public health departments share similar functions and a philosophy about serving the public, the federal government does not mandate how state and local health departments are structured. All states have a state health department, but the exact services that are offered and how they are administered vary greatly across the country. For example, in South Carolina, the state agency is centralized and the state provides services in each of the state's 46 counties, whereas in Idaho, local public health districts are completely independent from the state health department.

These differences allow states and localities to focus specifically on the needs of their citizens in a way that makes sense for them. For example, the needs of people in New York City—a densely packed urban community where residents

DEFEATING DISEASES: THE CASES OF SMALLPOX AND POLIO

For many centuries, smallpox was a feared disease that killed many. In 1796, Edward Jenner conducted the first successful smallpox "vaccination" with cowpox virus, a virus related to smallpox. Through vaccination, particularly through the successful technique of "ring vaccination" (described later in this section), smallpox was controlled. Vaccine development techniques improved over the years and by the 1940s, a stable, freeze-dried vaccine was perfected and used throughout the world. The last case of smallpox in the United States was in 1949, and the last case in the world was in Somalia in 1977. In 1980, the disease was considered eradicated—the first time that mankind had successfully eliminated a disease.

Polio was one of the most feared childhood diseases of the early- to mid-20th century. The first polio outbreak occurred in 1916 and resulted in more than 27,000 reported cases and 7,000 deaths. The disease peaked in 1952, with about 60,000 new cases and 3,000 deaths. The polio epidemic effectively ended in 1955 with the introduction of the Salk vaccine. The incidence of polio decreased by 85–90 percent between 1955 and 1957. With the introduction of a second vaccine that had been developed by Albert Sabin, by 1962, the incidence of polio had declined by 95 percent and was effectively eradicated in the Americas.

UNDERSTANDING HOW PUBLIC HEALTH WORKS

at the local and state levels is critical to understanding how a public health response to an emergency event will take place in a given community.

speak scores of different languages—will vary greatly from the needs of people in a mostly rural state, like South Dakota. How these places structure their service delivery will be understandably different. Therefore, in order to understand how immediate response to an emergency will occur in a given community, one must know how the local health department functions in that area.

The main goal of the remainder of this section is to provide an overview of how federal government public health agencies would function in an emergency and, when applicable, how their actions would relate to those of state and local governments and to the private medical system. This section appears in the beginning of this guide to provide a framework and context that are critical to understanding the "big picture" as well as many of the programs and processes discussed later in this guide. For example, in order to understand how a smallpox attack could unfold, the "Biological Agents" section is a key resource, but it is also important to understand how a smallpox attack would be discovered, how it would be reported, how it might be contained, and how vaccines would be delivered to communities. These are the kinds of issues discussed in this section. Some of the specific topics covered here include:

- Syndromic surveillance systems
- The role of epidemiology
- Laboratory testing
- Information sharing in public health
- Strategic National Stockpile
- Vaccination strategies
- Isolation and quarantine
- National Disaster Medical System
- The threats of emerging infectious diseases and influenza pandemics

THE IMPACT OF PUBLIC HEALTH

During the 20th century, the lifespan of the average American increased by more than 30 years. Much of this increase can be attributed to improvements in public health. In 1999, the U.S. Department of Health and Human Services' (HHS) Centers for Disease Control and Prevention (CDC) compiled the following list of the 10 greatest public health achievements of the 20th century (not in order of importance):

- **Vaccination—Vaccine use assisted in the eradication of smallpox worldwide and the elimination of polio in the Americas**
- **Motor-vehicle safety—Engineering advances and changes in behaviors, such as the use of seatbelts and child safety seats, have reduced death and injury rates**
- **Safer workplaces—Changes have reduced injuries and deaths related to many industries, such as mining, manufacturing, and construction**
- **Prevention and control of infectious diseases—Improved sanitation has reduced cholera and typhoid, while the advent of antibiotics has helped to combat tuberculosis and other diseases**
- **Decline in deaths from coronary heart disease and stroke—Decreases in smoking and better blood pressure control have reduced death rates from coronary heart disease and stroke**
- **Safer and healthier foods—Decreases in food contamination and fortification of foods with nutrients to protect against rickets, goiters, and other diseases have resulted in fewer deaths and illnesses related to food and nutrition**
- **Healthier mothers and their babies—Better hygiene and nutrition, antibiotics, and technological advances have reduced death and illness**
- **Family planning—Access to family planning and contraceptives has resulted in fewer maternal and child deaths**
- **Fluoridation of drinking water—Addition of fluoride to water has resulted in less tooth decay**
- **Recognition of tobacco use as a health hazard—Understanding the risks of smoking has led many smokers to stop, which has reduced deaths from smoking**

ACRONYM LIST

You may find it helpful to refer to the following list of acronyms as you read this section.

ATSDR	Agency of Toxic Substances and Disease Registry
BSL	Biosafety Level
CDC	Centers for Disease Control and Prevention
DHS	U.S. Department of Homeland Security
Epi-X	Epidemic Intelligence Exchange
FBI	Federal Bureau of Investigation
HAN	Health Alert Network
HHS	U.S. Department of Health and Human Services
LRN	Laboratory Response Network
NDMS	National Disaster Medical System
NEDSS	National Electronic Disease Surveillance System
NIAID	National Institute of Allergy and Infectious Diseases
NIH	National Institutes of Health
RRR	Rapid Response Registry
SNS	Strategic National Stockpile; formerly NPS
WHO	World Health Organization

PUBLIC HEALTH RESPONSE TO TERRORISM

After the September 11 and anthrax attacks in 2001, strengthening the public health infrastructure, particularly in relation to terrorism, became a heightened national priority. In the past several years, HHS and the U.S. Department of Homeland Security (DHS) have substantially increased funding (primarily to local and state governments) to build capacity to prepare for and respond to future terrorism events and/or other potential public health emergencies (e.g., a SARS or major influenza epidemic).

The remainder of this section will be organized by three stages that are typical of any public health response to a health-related emergency, including one caused by terrorist activity:

- Detection
- Response
- Containment

DETECTION

It is likely that the initial recognition of a possible terrorism incident will be at the local level. Incidents may be:

- **Overt** or immediately obvious (e.g., a bomb, an envelope containing a suspicious powder along with a message saying the powder is a deadly substance)
- **Covert** or quietly conducted without an obvious beginning (e.g., transmitting a disease, like smallpox, to people without any distinct signals)

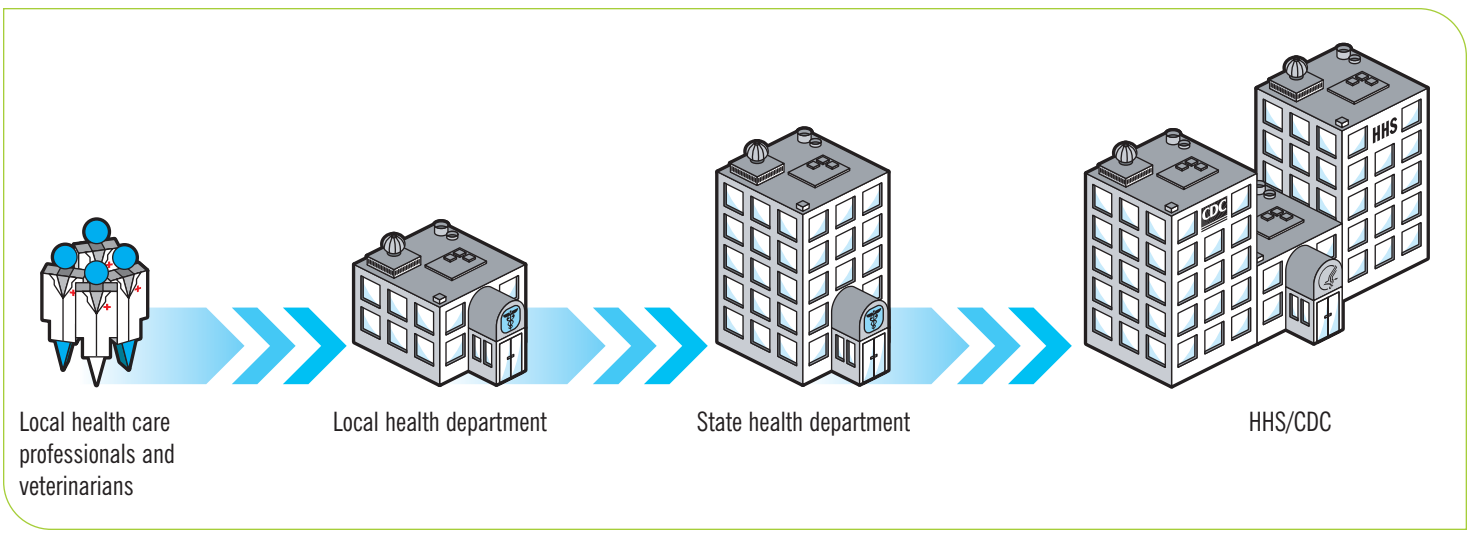
How each type of attack would unfold is quite different. An overt attack would be obvious and would immediately be responded to by local, state, and national law enforcement and public health officials. A covert attack would unfold more slowly and be harder to identify. It could be hours or days before officials would have any indication of the need for a response to such an attack.

Keeping Track of the Status of the Nation's Health

Domestic Systems

A covert attack is likely to be identified by the routine monitoring and analysis of data, called syndromic surveillance, on disease patterns and deaths that are performed in the public health and medical communities. As a result of concerns over the increased threat of terrorism and an increase in the use of electronic health information programs, health professionals can track and analyze data more easily and more quickly than ever before. The rapid availability of data increases the ability of public health officials to identify a large-scale terror attack in its early stages. For example, in late 2001, the New York City Department of Health and Mental Hygiene established a syndromic surveillance system to monitor

FIGURE 2–1: FLOW OF INFORMATION



emergency room visits. Symptoms, such as respiratory difficulties, fever, diarrhea, and vomiting, are tracked and information is transmitted electronically to the health department daily to be analyzed for unusual patterns that would warrant further investigation (Heffernan et al. 2004).

CDC and individual states have numerous surveillance policies and networks, some of which are fairly broad in scope and others which are focused on the tracking of specific diseases. Reporting at the local health department level is often electronic but is still done via paper forms in some places. Although data are entered into electronic systems, the transfer of the data is not always seamless or in real time. To address this issue, CDC is in the process of developing the National Electronic Disease Surveillance System (NEDSS) (http://www.cdc.gov/nedss/index.htm). NEDSS will create standards for the collection, management, transmission, analysis, access, and dissemination of data. The goal is to get data as close to real time as possible. Several pilot versions of NEDSS have been completed and are being used in some states, but the system is not yet fully operational.

CDC believes that NEDSS will offer significant improvements in the way public health surveillance is conducted at the local, state, and federal levels. The long-term vision for NEDSS is that of complementary Internet-based electronic information systems that:

- Gather health data automatically from a variety of sources on a real-time basis
- Facilitate the monitoring of the health of communities
- Assist in the ongoing analysis of trends and detection of emerging public health concerns
- Provide information for setting public policy

The data fed into the local systems are often the result of alert health care professionals. The following types of professionals may notice unusual disease patterns and deaths that will require further investigation:

- Doctors, nurses, and others working in health care institutions and clinics
- Veterinarians and animal control personnel
- Medical examiners
- Pharmacists
- Laboratory scientists
- Epidemiologists

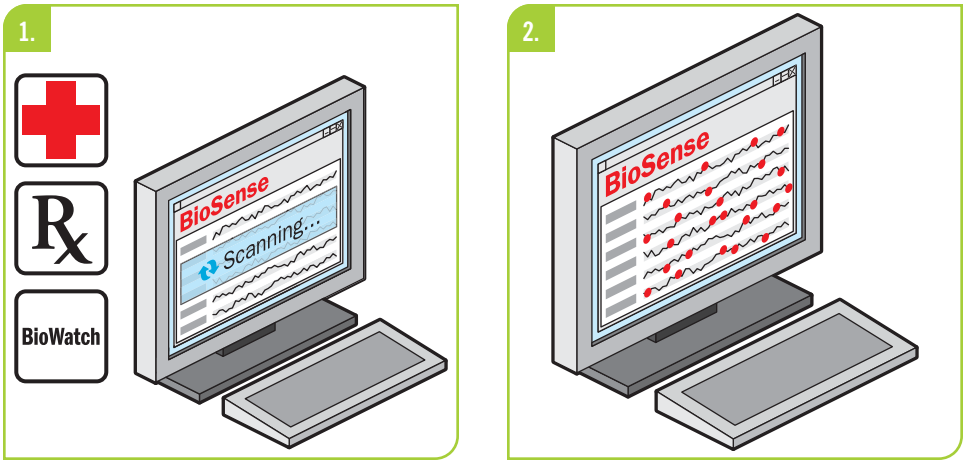
When health care professionals see atypical diseases, unusual patterns of diseases (e.g., large numbers of cases of disease not commonly seen in that part of the nation), larger than normal death rates from a disease, unusual rises or patterns in purchases of drugs, or uncommon test results, they contact

local public health officials. These officials will start investigating and may contact state and federal officials, as well as law enforcement, depending on the situation. Figure 2–1 illustrates how information flows from individual health care professionals through the system to local, state, and federal officials.

For example, in August of 1999, an infectious disease specialist contacted the New York City Department of Health about two patients with encephalitis in Queens. Preliminary investigations at nearby hospitals identified six additional cases. After talking to the patients' families, it became clear that all of the patients had participated in outdoor activities around their homes in the evenings, such as gardening. Mosquito breeding sites and larvae were also found in their area. Medical professionals believed at first that the disease was St. Louis encephalitis. However, 4 weeks after the outbreak in humans, a flavivirus, later identified as West Nile virus, was isolated from specimens from crows and a flamingo nearby and was determined to be the source of the outbreak for both animals and humans. These were the first cases of West Nile virus ever seen in the Western Hemisphere (Nash et al. 2001).

Another example, with a different outcome, occurred in the winter of 2003 when a state medical examiner in Virginia noticed an unusual pattern of childhood (ages 2–7) deaths over a short time period from what appeared to be a flu-like illness in one region of the state. This observation prompted a full-scale investigation to quickly identify the exact cause of the deaths and determine if all of the children died of the same cause.

FIGURE 2–2: HOW BIOSENSE WORKS



BioSense scans data from hospitals, pharmacies, and BioWatch for:

- Common symptoms
- Increased medical visits
- Increased drug purchases

BioSense identifies clusters or patterns of suspicious activity that could signal a possible emergency.

In the end, health officials learned that the children had died of a variety of causes, including the flu, and although the deaths had occurred in a short timeframe, the total number of deaths was not unusual for a given flu season (Commonwealth of Virginia Department of Health 2003).

BioSense

Late in 2003, CDC began operating a high-tech bioterrorism detection program, known as BioSense. BioSense monitors and rapidly picks up on any possible health emergencies by constantly scanning medical information from hospital emergency rooms and pharmacies (http://www.syndromic.org/pdf/work3-JL-BioSense.pdf). BioSense also scans environmental data from Project BioWatch, which is described in detail in the "Environmental Safety and Testing" (see p. 135).

BioSense monitors enormous databases to find groups of common symptoms, such as fever, rash, diarrhea, and nausea. The system can assess whether there are any sudden increases in the number of visits to emergency rooms or whether there are sharp increases of prescription and over-the-counter medication purchases in any given location. By comparing these increases with the normal number of visits and medication purchases, analysts can determine whether there might be a cluster of symptoms or an unusual pattern of symptoms that could signal a terrorist attack or other unusual public health problem that could be brewing (e.g., SARS). Eventually, BioSense will expand to include information from ambulance dispatches, clinics, doctors' offices, school-based clinics, and worksites.

International Systems

In our modern world, where international travel is common and rapid, a disease can spread around the globe very quickly. On an international level, the World Health Organization (WHO) has developed and monitored International Health Regulations (with origins in the mid-19th century) to help prevent epidemics from spreading worldwide. The regulations are being revised to address bioterrorism as well as chemical and radiological threats.

In 1997, WHO established a mechanism to identify, verify, and respond to public health emergencies that may be of international concern, working closely with government agencies and other partners throughout the world. Reports of current outbreaks that are thought to have international significance are included in a weekly e-mail service that is distributed to public health professionals and partners worldwide. This information is also available to the public on the Internet at http://www.who.int/csr/don/en.

In 2000, WHO also created the Global Outbreak Alert and Response Network to help its member states better identify and manage outbreaks that are unintentional as well as intentional. The network is a collaboration of 120 international partners, including scientific institutions, laboratories, United Nations organizations, and humanitarian organizations as well as many others. The main goals of the network are to:

- Combat the international spread of outbreaks
- Ensure that appropriate technical assistance reaches affected areas rapidly
- Contribute to long-term epidemic preparedness and capacity building

In 2004, the Global Public Health Information Network, an electronic surveillance system developed and maintained by Health Canada for WHO, was expanded and enhanced. The system uses powerful search engines to actively trawl the World Wide Web looking for reports of communicable diseases in electronic discussion groups, on news wires, and elsewhere on the Web. The system also disseminates preliminary reports on public health threats on a "real-time, 24/7" basis. The Global Public Health Information Network now provides early warning in all official United Nations languages—Arabic, Chinese, English, French, Russian, and Spanish—allowing for speedier screening and sharing of information on both natural and manmade threats.

Additionally in 2004, WHO's Strategic Health Operations Center (SHOC) opened. SHOC features a communications system that allows the staff to closely monitor international public health response activities around the world. SHOC health experts, technical advisors, and logistics planners watch and assist their colleagues on the ground as they deal with crises ranging from SARS or Ebola outbreaks to tropical storms and tsunamis.

More information on the role of the WHO in international surveillance, preparedness, and response can be found at WHO's Communicable Disease Surveillance and Response program Web site (http://www.who.int/csr/en).

The Role of Epidemiology

This section provides an overview of the role of epidemiology, or disease investigation, in a public health emergency. The science of epidemiology is quite complex and epidemiologists often use highly technical language to explain their findings.

Epidemiologists at the local, state, and federal levels conduct investigations of suspected or confirmed disease or injury outbreaks. In some cases, an epidemiologist may even be the person who spots the outbreak by noticing unusual patterns for a disease in routine surveillance data (as described previously). Once a problem is identified through surveillance, epidemiologists will launch a more comprehensive investigation. Their findings are used to determine the source of an illness and make recommendations to guide public health intervention.

Steps for Investigating an Outbreak

Epidemiological investigations evolve through three phases: the preliminary phase, the analytic study phase, and the control and followup phase. Epidemiologists complete several steps within each of these phases to help them systematically collect information, test hypotheses, and communicate findings. Although these steps often occur simultaneously, they may be repeated as new information becomes available. The entire

A glossary of some commonly used epidemiology terms is included in appendix C of this guide as a reference.

> **"EPIDEMIOLOGY IS THE STUDY OF PATTERNS OF DISEASE:** who has the disease, how much disease they have, and why they have it."
>
> *Daniel Wartenberg, "Epidemiology for Journalists"*

investigation process is methodical but also needs to be rapid and responsive to stop the spread of the disease and treat those affected as soon as possible.

Preliminary Phase

- Work with lab data and disease tracking data to confirm the outbreak.
- Research the symptoms, causes, and routes of transmission of the disease.
- Assemble a multidisciplinary investigation team that includes experts in clinical medicine, environmental health, microbiology, behavioral science, and health education.
- Define what a case of the disease looks like so that cases can be accurately identified.
- Investigate medical records and conduct patient interviews to identify related cases.
- Summarize collected data by time, person, and place and tabulate.
- Take immediate control measures if an obvious source of illness is identified.

Analytic Study Phase

- Develop hypotheses about the cause of the outbreak, based on knowledge about the microbiology of a disease, background research, and patient interviews.
- Test hypotheses analytically with existing data.

Outbreak Control and Followup Phase

- Implement prevention and control measures to stop additional outbreaks by collaborating with government, industry, and health officials.
- Prepare health promotion messages for the public.
- Select a spokesperson to share health promotion messages with the media.
- Evaluate the short- and long-term effects of the investigation.
- Prepare a detailed summary of the investigation and recommendations for participants (FOCUS Workgroup 2003).

Interviewing and Contact Tracing

One of the key methods used to investigate an outbreak is the interviewing of patients. These interviews provide epidemiologists with some of the data needed to map the spread of an outbreak (i.e., where it came from and where it might be going). For example, by talking to patients, epidemiologists may learn that all of the patients attended the same event, which provides clues about how the outbreak started. Interviews may allow the epidemiologists to determine the index case (the first known case), which may be critical to determining the origin of the outbreak. Epidemiologists also use interviews to identify the close contacts of each patient (called contact tracing). Close contacts are those people who spend a lot of time in close, physical proximity to the patient (e.g., family members, office mates, significant others). In the case of a contagious disease, these people must be found and treated or isolated to prevent the spread of the illness.

THE BASIC STEPS OF AN OUTBREAK INVESTIGATION

1. **Verify the diagnosis and confirm the outbreak.**
2. **Define a case and search for cases.**
3. **Tabulate and orient data: time, place, person.**
4. **Take immediate control measures.**
5. **Formulate and test hypotheses for the cause of the outbreak.**
6. **Plan and execute additional studies, as needed.**
7. **Implement and evaluate control measures.**
8. **Communicate findings.**

Possible Indications of a Bioterrorism Event

Health professionals, including epidemiologists, will use the same methods to investigate a bioterror event that they would use to investigate any other outbreak. In many cases today, bioterrorism may be considered as the possible cause of an outbreak unless

proven otherwise. In some cases, an attack may be suspected either because there is evidence of the agent (e.g., anthrax powder) or because of intelligence or claims of responsibility. In less obvious cases, there are also a few characteristics (see box on the right side of this page) that may indicate that an outbreak is intentional, particularly if several of these characteristics are true of the outbreak.

Even though these characteristics may point to bioterrorism, many of them may also be true in new and emerging naturally caused infectious diseases, like SARS or West Nile virus. Over the past 30 years, CDC has been involved in the discovery of many emerging naturally occurring infectious diseases that have the characteristics described here. For example, in 1993, there was an outbreak of Hantavirus Pulmonary Syndrome in the Southwestern United States. This severe pneumonia of unknown origin, which affected healthy adults, had never been seen in the United States before, which made the outbreak suspicious. Outbreaks of avian flu—bird flu not previously seen in humans—in China since 1997 are also examples of unusual but naturally occurring outbreaks. (More information on avian flu and animal diseases that may affect humans can be found at the end of this section.) Therefore, although the question of "Is it bioterrorism?" is likely to be asked in unusual situations, public officials will be careful not to prematurely assume that bioterrorism is the cause of an outbreak (Reynolds 2002).

RESPONSE

Laboratory Testing

Once a potential attack is identified, the public health response will immediately begin. Law enforcement, the Federal Bureau of Investigation (FBI), and local and state health and emergency officials will typically work together to determine if a suspicious outbreak is related to terrorism. Law enforcement and forensic scientists may actually begin work at any stage of the public health process, depending on the situation. If possible, the FBI will arrange for samples of the agent to be sent to a special laboratory for testing. It is likely that this lab would be a local or state lab that is a part of the national Laboratory Response Network (LRN), which is described in detail later in this section.

A positive result from an initial screening test, however, does not provide confirmation. Initial field testing (onsite) is considered presumptive, which means that additional tests must be performed to confirm the original test result (CDC 2004b). If a specific agent is suspected, tests may also be used that are specific to that agent (if any exist). For example, if anthrax is suspected, nasal swabbing may be done on people who were present in the environment where the suspected anthrax release took place. (However, it is important to note that nasal swabs are not used for diagnostic purposes; rather, they may provide information on whether a given environment has been contaminated. They do not indicate who will get anthrax illness.) If a chemical agent is suspected, blood or urine samples can be collected from people with suspected exposures.

CHARACTERISTICS OF OUTBREAKS THAT MAY INDICATE POSSIBLE BIOTERRORISM

- **A large number of cases appearing at the same time, particularly in a discrete population (e.g., people from the same town, people who attended the same event)**
- **A large number of cases of a rare disease or one considered a bioterrorism threat (e.g., plague, tularemia)**
- **More severe cases than typical for a given disease and/or an unusual route of exposure**
- **A disease that is unusual in a given place or is out of season (e.g., a flu outbreak in the summer in the United States)**
- **Multiple simultaneous outbreaks of the same disease or different diseases**
- **A disease that affects animals as well as humans**
- **Unusual disease strains or uncommon antibiotic resistance to an organism**

Although initial positive test results may begin the process of emergency and public health response (e.g., determining who may have been exposed, deciding who will need treatment), it can take up to a few days in some cases to confirm which agent is at work. Some of the time is needed to make sure that samples are collected properly and transported to labs with the ability to do the needed testing. More detailed information on diagnostic testing for specific biological agents can be found in the "Biological Agents" section (see p. 39).

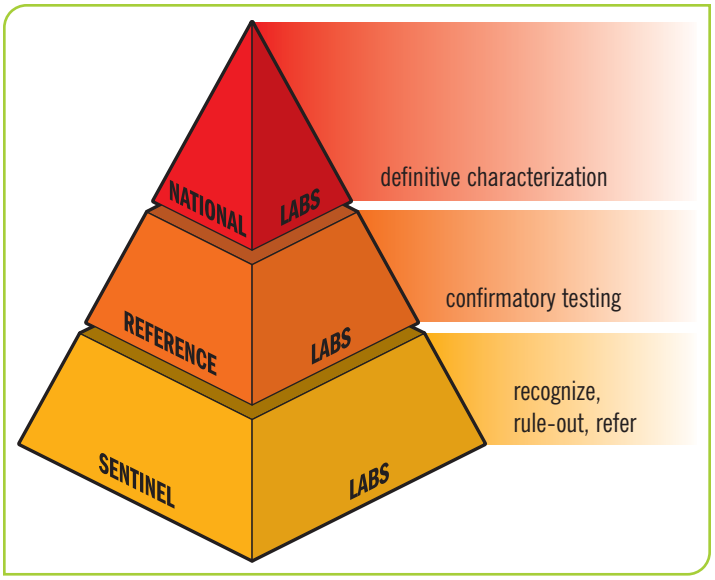
Laboratory Response Network

To make it easier for laboratories across the country to work together in the case of an act of terrorism or other public health emergency and to facilitate rapid identification of a bioterrorism agent, CDC, the Association of Public Health Laboratories (http://www.aphl.org), and the FBI formed the Laboratory Response Network (LRN) in 1999 (http://www.bt.cdc.gov/lrn/pdf/lrnfactsheet.pdf). The LRN currently has two major components: a well-developed network of public health laboratories dealing with biological agents and a newer network of public health laboratories dealing with chemical agents.

Bio-LRN

The Bio-LRN is a network of about 120 labs in all 50 states that include local, state, and federal public health labs as well as international, veterinary diagnostic, military, and other specialized labs that test environmental samples, animals, and food. The network is made up of three levels of labs that handle progressively more complex testing:

FIGURE 2–3: THE BIO-LRN



Source: Association of Public Health Laboratories. (2003). State public health laboratory bioterrorism capacity. *Public health laboratory issues in brief: Bioterrorism capacity*, 1–6. http://www.aphl.org/programs/emergency_preparedness/files/BT_Brief_2003--corrected.pdf.

Sentinel Labs

- Private and hospital labs that routinely process patient tests.
- May be the labs to first test and/or recognize a suspicious organism.
- Conduct tests to "rule out" less harmful organisms.
- Refer samples to a reference lab, if they cannot rule out that the sample is a bioterror agent.

Reference Labs

- Have specialized equipment and trained personnel.
- Perform tests to detect and confirm the presence of a bioterror agent.
- Are capable of producing conclusive, confirmatory results.
- Include local, state, and federal labs.

National Labs

- Include CDC, the U.S. Army Medical Research Institute for Infectious Diseases in Maryland, and the Naval Medical Research Center, also in Maryland.
- Perform highly specialized testing to identify specific disease strains and other characteristics of an investigated agent.
- Test certain highly infectious agents that require special handling.

The Bio-LRN has been involved in a number of major testing operations since it was established in 1999. In the 2001 anthrax attacks, Bio-LRN labs tested more than 125,000 samples by the time the investigation was completed. Bio-LRN labs are also involved in BioWatch, a program in selected American cities that uses air samplers to test for bioterrorism agents. (More information on BioWatch can be found in the "Environmental Safety and Testing" section [see p. 135].) Bio-LRN labs were also involved in developing tests and materials to support the DNA sequencing of the SARS virus, which was identified at the CDC (CDC 2004a).

Chem-LRN

The Chem-LRN is a network of 61 laboratories in all states and some territories and municipalities that test for chemical agents in human samples, such as urine or blood. The Chem-LRN member laboratories have three levels of activities. Each level builds on the activities of the preceding level.

- Every network member participates in Level 1 activities. These Level 1 laboratories work with hospitals in their jurisdiction and maintain competency in clinical specimen collection, storage, and shipment.
- Forty-one laboratories also participate in Level 2 activities, meaning that the laboratories are trained to detect exposure to a limited number of toxic chemical agents.
- Five laboratories participate in Level 3 activities. These laboratories are able to detect exposure to an expanded number of chemicals, including those analyzed by Level 2 laboratories, as well as analyses for mustard agents, nerve agents, and ricin.

Responding to an Event

- At the onset of an event, a state may request CDC's assistance. CDC may then deploy a Rapid Response Team to the affected state to assist with specimen collection, packaging, storage, and shipment.
- Representative samples from people who are suspected to be highly exposed, moderately exposed, and those thought to have low exposure are sent to CDC for analysis through the Rapid Toxic Screen, which can analyze people's blood or urine for a large number of chemical agents likely to be used by terrorists.
- Data produced from the Rapid Toxic Screen and the health implications associated with those exposures will be communicated in a secure, electronic manner to the affected state.
- Hospitals and laboratories may be dealing with many people concerned about exposure. There will be a need to respond to these concerns and determine whether an individual has been exposed and at what level. CDC will contact the appropriate LRN labs to help participate in the response.

Biosafety Level Classifications

All labs in the United States are rated according to a biosafety level (BSL) classification system. Levels range from 1 to 4. Biosafety levels are used to determine the types of agents scientists can work with in their labs. Scientists use a combination of critical principles, practices, and safety devices to work with infectious materials safely and effectively. Biosafety level classifications are designed not only to protect researchers and technicians from laboratory-acquired infection but also to prevent microorganisms from entering the environment. Many microorganisms may be studied at more than one level, depending on what kinds of activities are involved.

The four BSLs define proper laboratory techniques, safety equipment, and design, as described below:

BSL-1 LABS

These labs are used to study agents not known to consistently cause disease in healthy adults (e.g., *E. coli*). Researchers follow basic safety procedures and require no special equipment or design features.

BSL-2 LABS

These labs are used to study agents that pose a danger if accidentally inhaled, swallowed, or exposed to the skin (e.g., plague). However, diseases related to these agents can be treated through available antibiotics or prevented through immunization. Safety measures include the use of gloves, eyewear, and lab coats as well as hand washing sinks, methods of waste decontamination, and safety equipment.

BSL-3 LABS

These labs are used to study agents that can be transmitted through the air and cause potentially lethal infection (e.g., West Nile virus). Researchers perform lab manipulations in a gas-tight enclosure. Other safety features include personal protective equipment, clothing decontamination, sealed windows, and specialized ventilation systems.

BSL-4 LABS

These labs are used to study agents that pose a high risk of life-threatening disease for which no vaccine or therapy is available (e.g., Ebola). Lab personnel are required to wear full-body, air-supplied suits and to shower when exiting the facility. The labs incorporate all BSL-2 and BSL-3 features. In addition, BSL-4 laboratories are negative-pressure rooms that are completely sealed and isolated to prevent release of viable agents into the environment (National Institute of Allergy and Infectious Diseases 2004a; Richmond 2000).

All labs participating in the Bio-LRN are BSL-3 or BSL-4 labs.

SELECT AGENT PROGRAM

As a safeguard against the accidental or intentional exposure of dangerous agents outside of laboratories, CDC developed the Select Agent Program in 1996 to control the possession, packaging, labeling, and transport of certain agents that are capable of causing substantial harm to human health and safety. The program requires that facilities that work with such agents, including government agencies, universities, research institutions, and commercial entities, register with CDC. In addition to tracking and safeguarding the use of these agents, the Select Agent Program established systems for alerting authorities if unauthorized attempts are made to acquire these agents by terrorists or others. These requirements are outlined in the Select Agent Regulation, which was officially published in 2002. The regulation includes a list of dozens of agents to which it applies, including viral hemorrhagic fevers (like Ebola), smallpox, plague, ricin, anthrax, and avian flu. More detailed information on the Select Agent Program and the Select Agent Regulation can be obtained on the program's Web site (http://www.cdc.gov/od/sap/index.htm).

Expansion of the Current Laboratory System

The National Institute for Allergy and Infectious Diseases (NIAID), of HHS' National Institutes of Health (NIH), is funding extensive research on new and improved medical countermeasures—diagnostic tests, drugs, and vaccines to detect, treat, and prevent illness from potential agents of bioterror. Much of the research to develop medical countermeasures for potential agents of bioterror needs to be conducted in BSL-3 or BSL-4 laboratories. Many institutions and companies with infectious disease research programs have BSL-3 laboratories, but many are small, need modernization, or are dedicated to a specific use. There is currently a limited number of BSL-4 labs operating in the United States in the following locations:

- CDC in Atlanta, GA
- U.S. Army Medical Research Institute of Infectious Diseases at Fort Detrick, near Frederick, MD
- Southwest Foundation for Biomedical Research in San Antonio, TX
- University of Texas at Galveston, TX

NIAID is funding the construction of four new laboratories that will have BSL-2 to BSL-4 capabilities as well as the construction or renovation of some facilities with BSL-2 and BSL-3 capabilities. In addition to advancing research, these labs may also expand the LRN and/or supplement the current LRN labs in responding to a public health emergency. The four new laboratories include facilities at the following locations:

- NIH headquarters in Bethesda, MD
- NIAID at Fort Detrick, near Frederick, MD
- NIAID's Rocky Mountain Laboratories in Hamilton, MT
- University of Texas Medical Branch at Galveston, TX

More information on the new laboratories can be found on the NIAID Web site (http://www.niaid.nih.gov/factsheets/facility_construction.htm).

It should be noted that HHS is not funding research on bioweapons. Such research is prohibited by international law. To identify treatments and ways to prevent epidemics, however, scientists sometimes need to work with small quantities of the actual microbes or toxins in extremely well-controlled protected facilities.

HHS Support for Hospital Preparedness

To strengthen local response, in 2002, HHS' Health Resources and Services Administration started the National Bioterrorism Hospital Preparedness Program. The program is helping to improve hospital capabilities and surge capacity (the ability of a hospital to handle a large influx of patients at one time, often requiring specialized medical equipment and treatment), staff training, and the building of specialized facilities, such as decontamination areas.

To receive funding through the program, states must enter into cooperative agreements with the Health Resources and Services Administration, agreeing to use the funds for certain activities. In 2002, activities focused on needs assessments and planning for state agencies, hospitals, and other health care facilities, such as outpatient centers, emergency medical services, and poison control centers. All states were required to make plans with their hospitals for dealing with an epidemic involving 500 or more patients in their state or region. Other topics that the response plans cover include:

- Communication between hospitals and emergency responders
- Procedures for receipt and distribution of vaccines, antibiotics, and supplies from federal sources (like the Strategic National Stockpile)
- Quarantine, isolation, and decontamination
- Hospital lab capacity
- Personal protective equipment
- Emergency drills
- Personnel training

Local and state governments are actively working with their hospitals to implement the elements outlined in the plans to enhance local preparedness.

Information Sharing In the Public Health Community

Once lab tests confirm the presence of a terrorism agent, information will need to be distributed throughout the medical community quickly to facilitate identification of additional patients and advise health care providers about treatment. Over the past several years, CDC has been developing several national networks to encourage and facilitate the sharing of information within the public health community. The networks are designed to help health officials and hospitals around the country share information both before and during public health emergencies.

Health Alert Network

The Health Alert Network (HAN) (http://www.phppo.cdc.gov/HAN/Index.asp), which was introduced by CDC in 1998, is a nationwide, integrated electronic information and communications system for the distribution of health alerts, prevention guidelines, national disease surveillance, and laboratory reporting. HAN is a collaboration between CDC, local and state health agencies, and national public health organizations. It allows for the sharing of information between state, local, and federal health agencies as well as hospitals, laboratories, and community health providers. There is also a distance-learning component to allow network users to continually increase their knowledge of bioterrorist threats via satellite and the Internet.

HAN is designed to assist public health and emergency response *during* a terrorism event as well as any public health emergency. It provides early warnings by broadcast fax and e-mail to alert officials at all levels about urgent health threats and appropriate actions. There are three categories of HAN messages:

HEALTH UPDATE

Provides updated information regarding an incident or situation; unlikely to require immediate action.

HEALTH ADVISORY

Provides important information for a specific incident or situation; may not require immediate action.

HEALTH ALERT

Conveys the highest level of importance; warrants immediate action or attention.

These messages can be viewed over the Internet on the HAN Web site (http://www.phppo.cdc.gov/HAN/Index.asp).

HOW ONE STATE'S HEALTH AND HUMAN SERVICES SYSTEM USES HAN

States have taken many different approaches to creating their own HANs. One state developed a HAN home page on its HHS Web site. In the future, health professionals will be able to register online to be a part of the state HAN network and gain access to secure Web pages. The state's HHS Web site provides links to the HAN, emergency contact numbers, and other terrorism information. It also has a link to a list of news releases on HAN-related issues. The state also has special emergency Web pages ready to activate in the event of a public health emergency.

In addition to the national HAN network that is led by CDC, CDC has encouraged states to develop their own HAN networks and is providing funding and technical assistance in conjunction with other health organizations, such as the National Association of County and City Health Officials and the Association of State and Territorial Health Officials.

Epidemic Information Exchange

The Epidemic Information Exchange (Epi-X) is a secure, Web-based communication network that was created in 2000 to connect CDC and other federal health agencies, state and local health departments, poison control centers, laboratories, and other public health professionals in the United States and neighboring countries. Since 2000, Epi-X (http://www.cdc.gov/mmwr/epix/epix.html) has posted over 4,000 reports of disease outbreaks and other health threats, and has grown to include more than 3,000 public health professionals nationwide. To protect health on the U.S. border, senior health officials in Mexico and Canada also share information on Epi-X.

In contrast to the fairly open membership structure of HAN, health agencies authorize certain officials to participate on Epi-X and share provisional technical information. Peers contribute information to CDC, monitor the network 24 hours a day, and typically post reports within minutes to hours of submission. Epi-X staff also send out daily e-mails to users about new reports and events. Staff can also notify users immediately by e-mail, pager, and telephone if a situation is deemed an emergency. In addition to near daily use during the response to routine disease outbreaks, Epi-X has been used for a number of major public health crises, including the outbreaks of West Nile virus, SARS, and monkeypox. Figure 2–4 illustrates the operation of Epi-X in both normal and emergency situations.

CONTAINMENT

Once an attack has been confirmed, public health officials may use a variety of tactics to control its effects, ranging from distributing antibiotics to using quarantine strategies. This section describes several methods that might be used for containment.

Strategic National Stockpile

What SNS Is

The Strategic National Stockpile (SNS) (formerly the National Pharmaceutical Stockpile) (http://www.bt.cdc.gov/stockpile/index.asp) is a national repository of critical medical supplies designed to supplement and resupply state and local public health agencies in the event of a national emergency anywhere and at anytime within the United States or its territories. The goal of the SNS program is to provide rapid delivery of SNS lifesaving pharmaceuticals to any location within all U.S. states and territories within 12 hours or less from the federal decision to deploy. The SNS program is managed by CDC and is carried out in conjunction with state and local communities who have responsibility for developing their own local plans for the receipt and distribution of SNS supplies. SNS distributes medical supplies and provides technical assistance to states in their planning efforts related to the receipt and distribution of SNS assets. SNS only distributes medical supplies—it does not operate mass casualty centers or clinics.

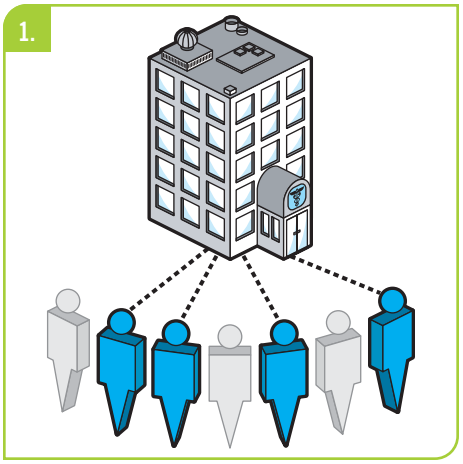
What SNS Includes

Items included in SNS are based upon current terror threats, the vulnerability of the U.S. civilian population, and availability and ease of distribution of supplies. SNS contains multiple caches of medical supplies stored in warehouses in different regions across the country. These caches include antibiotics, chemical antidotes, antitoxins, life-support medications, intravenous (IV) administration, airway maintenance supplies, and medical/surgical items.

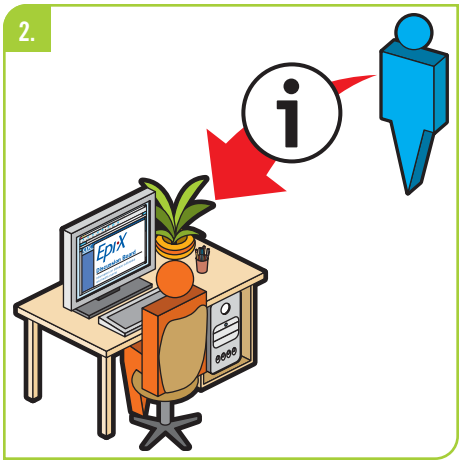
How SNS Is Activated

- The affected state's Governor's office requests SNS materials from HHS or CDC.
- HHS assesses the situation and determines prompt and appropriate action. This assessment could include consultation with other federal agencies and entities (e.g., DHS).
- Supplies are sent in what are called "12-hour Push Packages," which contain a broad range of products that may be needed in the early hours of an emergency and are ready to be loaded on trucks or aircrafts. These supplies would go directly to predesignated sites, depending on the situation and the plans made by the affected community.

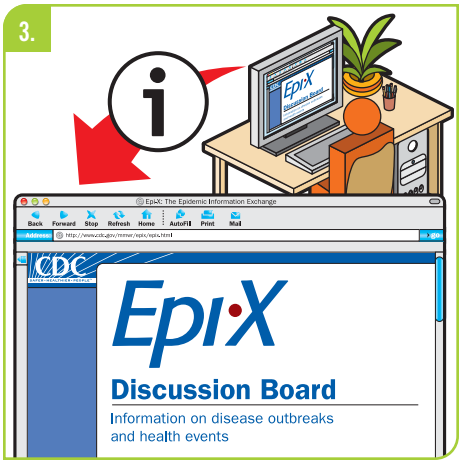
FIGURE 2–4: EPI-X NORMAL OPERATION



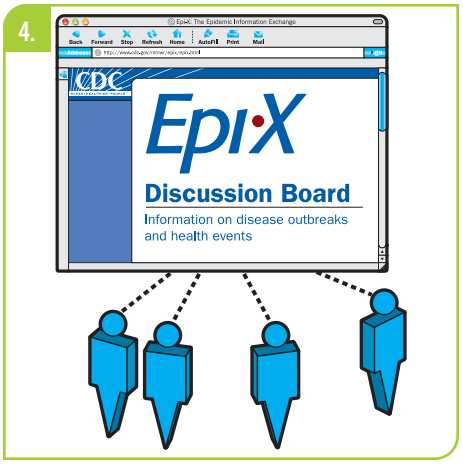
State health agencies select Epi-X members.



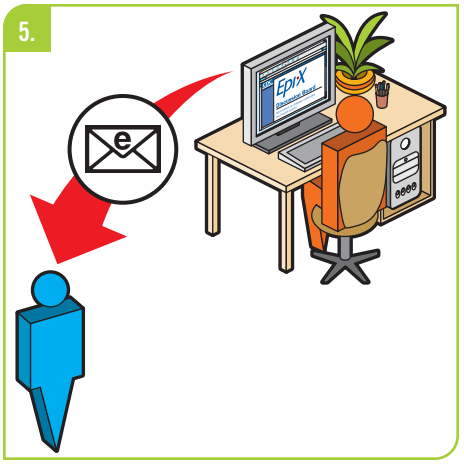
Members send important information to Epi-X staff.



Epi-X staff edit and post information from members on discussion board.

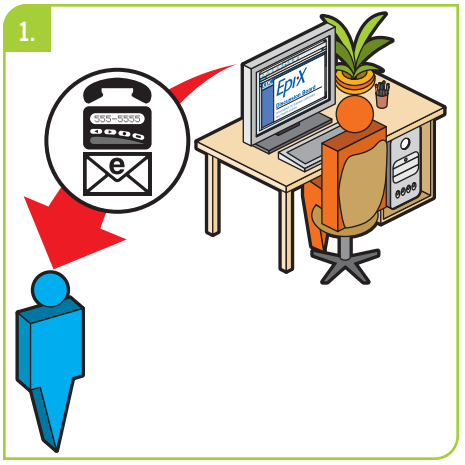


Epi-X members can access discussion board to get information.



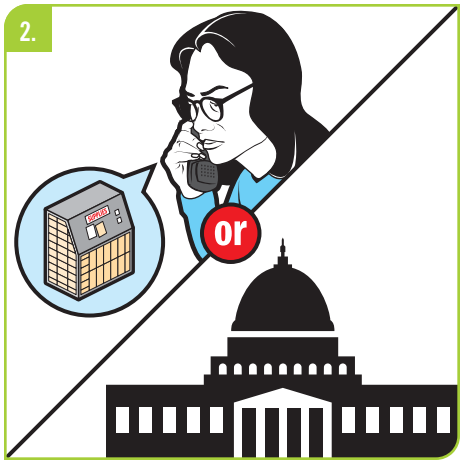
Epi-X staff also send out daily e-mails to users about new reports and events.

EPI-X EMERGENCY OPERATION

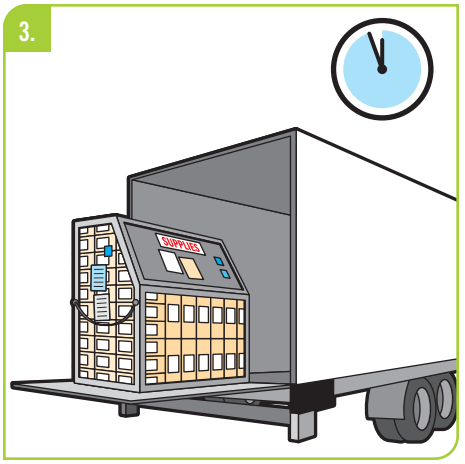


Epi-X staff notifies members immediately via e-mail, pager or telephone.

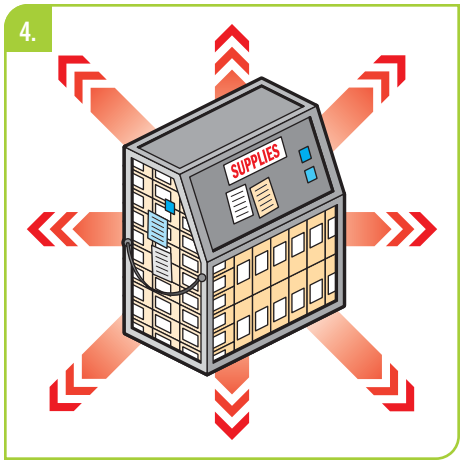
FIGURE 2–5: SNS ACTIVATION



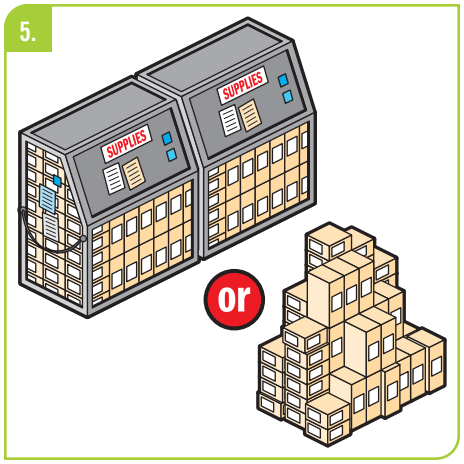
Either the state requests SNS supplies or the federal government determines there is a need.



SNS supplies arrive within 12 hours anywhere in the United States or its territories.



State and local officials distribute supplies according to their SNS distribution plans.



Additional supplies may be sent directly from Vendor Managed Inventory or Stockpile Managed Inventory, or in lieu of Push Packages.

- If an incident requires additional pharmaceuticals and/or medical supplies, additional shipments of supplies through Vendor Managed Inventory and Stockpile Managed Inventory will be shipped to arrive within 24–36 hours. These shipments can be tailored to provide pharmaceuticals, supplies, and/or products specific to the suspected or confirmed agent(s) in addition to or instead of the 12-hour Push Packages.
- CDC is also funding the Cities Readiness Initiative, a pilot program to direct funding to targeted cities to increase their capacity to deliver medicines and medical supplies during a large-scale public health emergency. This program helps ensure state and local partners have effective plans for receiving, storing, and dispensing medication to large populations when needed.

How SNS Is Managed

- The SNS program helps support state and local governments, health care providers, and first responders in the development of plans and capabilities to receive, secure, distribute, and dispense SNS supplies. With SNS program assistance, state and local officials develop, train, and exercise state-specific plans for utilizing SNS.
- Local and state officials are responsible for the distribution of SNS supplies once they arrive at agreed upon receiving sites.
- While SNS supplies are being transported, the SNS program will deploy its Technical Advisory Response Unit. The unit's staff will coordinate with state and local officials so that SNS supplies can be efficiently received and distributed upon arrival at the site.
- The SNS program ensures that medical supplies are rotated and kept within potency shelf life limits. This involves quarterly quality assurance/quality control checks on all 12-hour Push Packages; a full inventory conducted annually of 12-hour Push Package items; and inspections of environmental conditions, security, and overall package maintenance.

Figure 2–5 illustrates how SNS is activated.

HOW A VACCINATION CLINIC OR SNS DISTRIBUTION SITE MIGHT FUNCTION

Although most communities have done advance planning in terms of where clinics and dispensing sites may be held and how they will work, the exact location and setup will be incident specific. As a result, the local media would be heavily relied on to get information out about who should go to one of these sites and where and when they will be open.

HHS has also recommended that, if a clinic or dispensing site needs to be used, the center should be open for the local media to tour before it is officially opened so that local media can provide information to the public about what to expect when they arrive at the site.

Public health officials will request that people bring the following information to receive appropriate treatment:

- **Photo identification (driver's license, military ID, company badge)**
- **Medical records, including previous immunizations, current medications, and allergies**
- **Current age and weight of children**

It is helpful for people to gather this information before the emergency and keep in a safe, but easily accessible, place.

This information would be requested strictly for medical reasons. Anyone who needs treatment will be able to get treatment free of charge and regardless of immigration and residency status.

Vaccination Strategies

One method that public health officials may use to control an outbreak of some diseases caused by bioterrorism is vaccination. Vaccines cause the body to produce antibodies, which protect the body against later infection by a particular agent. However, vaccines are not available for many diseases and not all vaccines work the same way. Smallpox vaccine, for example, provides almost immediate immunity and can be beneficial even if someone is vaccinated a few days after exposure. Other vaccines, such as the anthrax vaccine, may require a number of doses over time before the recipient builds up immunity. Therefore, vaccines may or may not be helpful in a sudden outbreak, depending on the disease and incident.

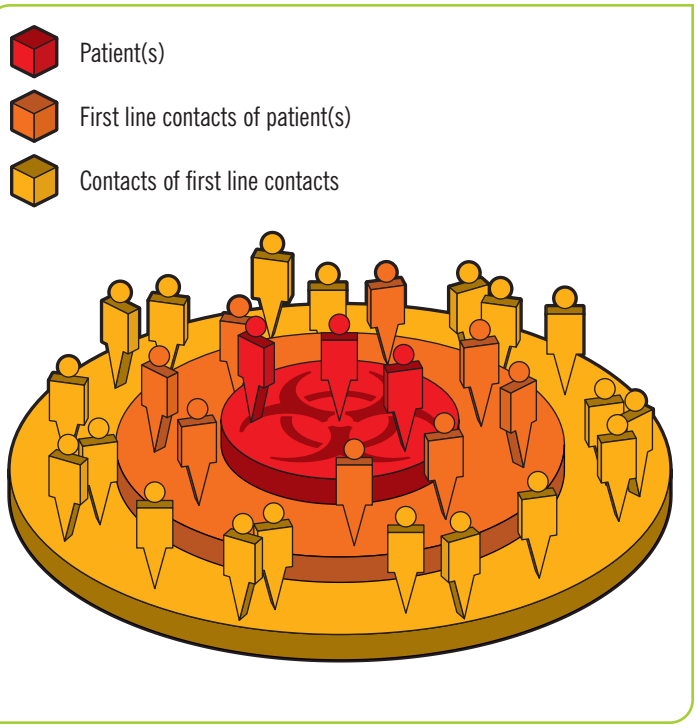
Scientists are currently doing research on vaccines to combat various bioterror agents, but currently, the only major bioterror agents for which vaccines are available in case of an attack are smallpox and anthrax. Although these vaccines may be used in case of an attack, they are not currently available to the general public due to potential vaccine side effects and other issues. However, these vaccines may become available in the case of an attack. In fact, in October 2004, HHS awarded a contract to VaxGen, Inc., to produce 75 million doses of a new anthrax vaccine for the SNS. Additional details on vaccines can be found in the "Biological Agents" section (see p. 39) and on NIAID's Web site (http://www2.niaid.nih.gov/biodefense).

Smallpox Vaccination

Although vaccination before a smallpox event has been a hotly debated topic over the past several years due to potential side effects of the vaccine, in the case of a smallpox "outbreak," it is likely that public health officials would turn to vaccination because the risks associated with the smallpox illness would be much higher than the risks of the possible vaccine side effects. There are two main ways to conduct vaccination for smallpox:

- Ring vaccination
- Mass vaccination

FIGURE 2–6: RING VACCINATION



Source: CDC & WHO. (2003). Course: "Smallpox: Disease, prevention, and intervention." Day 2, Module 4: Vaccination strategies to contain an outbreak. PowerPoint presentation. http://www.bt.cdc.gov/agent/smallpox/training/overview.

Ring Vaccination

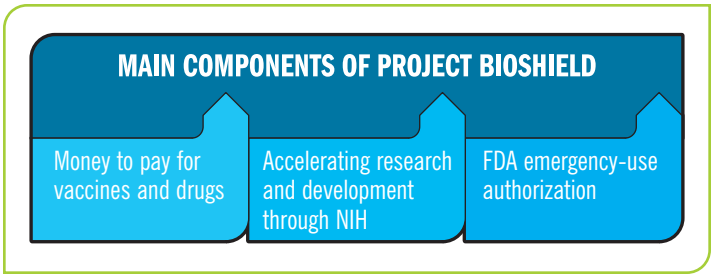
Ring vaccination was the primary strategy that was used to control smallpox outbreaks and led to the complete eradication of the disease worldwide by 1980. It involves finding and vaccinating the contacts of smallpox patients. First line contacts are those who have had face-to-face contact (6 feet or less; for example, at school or the workplace) and those living in the same household as the person who has smallpox. Then, close contacts of the first line contacts are vaccinated to make sure to break the chain of transmission. For the contacts of contacts, those who have what are called contraindications (medical conditions that may cause adverse reactions to the vaccine; for example, eczema or immune deficiencies) are not typically vaccinated.

Ring vaccination is typically effective if the outbreak appears to be small and contacts can be identified quickly. It minimizes the number of people who will need to be vaccinated and who may have reactions to a vaccine. (Note: Someone cannot contract smallpox from the smallpox vaccine.)

Mass Vaccination

Depending on the nature of the outbreak, public health officials may decide to use a mass vaccination strategy. Some reasons that a mass vaccination may be used include: if the number of cases is high, if outbreaks occur in a number of locations, and/or if the outbreaks continue to grow despite the use of ring vaccination. Since routine vaccination for smallpox in the United States ended for the general public in 1972 and there are large numbers of Americans who are susceptible to the virus, mass vaccination would be strongly considered for a smallpox outbreak. If mass vaccination were indicated, supplies from SNS would be used, and it is planned that vaccine clinics would be set up to vaccinate people quickly and efficiently.

FIGURE 2–7: BIOSHIELD



Project BioShield

Project BioShield was signed into law in July 2004. The program is designed to provide incentives for the pharmaceutical and medical technology industries to develop and make available modern, effective drugs and vaccines to protect the population against attack by biological and chemical weapons or other dangerous toxins (http://www.hhs.gov/news/press/2004pres/20040721b.html). Many existing medications, such as vaccines or other drugs, are 20 or 30 years old and are available in limited supply or may have significant side effects (e.g., smallpox vaccines). Recommended decontamination procedures and other treatments for chemical and radiation exposure have not changed much since the 1970s (National Memorial Institute for the Prevention of Terrorism 2004). For many biological and chemical agents, no specific vaccines or treatments have been developed yet, based in part on the absence of a market and thus reduced financial incentives for industry to develop new products and devices (Gottron 2003) as well as a variety of liability concerns.

Project BioShield allows the federal government to buy improved vaccines and other drugs for smallpox, anthrax, and botulinum toxin for SNS. It will also speed up the product development and approval cycle for new countermeasures against other dangerous pathogens, such as Ebola and plague, as soon as scientists verify their safety and effectiveness, by authorizing HHS and DHS to buy drugs, vaccines, medical devices, and other supplies up to 5 years before the products would normally be expected to come to market. To help make new treatments available to the public in an emergency, a new law guarantees a government market for otherwise experimental drugs and medical treatments.

How BioShield Works

Project BioShield has three main components:

- Ensuring that resources are available to pay for vaccines and other drugs
- Speeding up NIH research and development by authorizing NIAID to accelerate the normal contracting, scientific peer review, and approval processes
- Providing new emergency-use authorization for the Food and Drug Administration (FDA) for medical treatments that have not been formally approved and licensed

HHS will have new funding authority to identify and include medical countermeasures in SNS. Products in development include new smallpox vaccines as well as treatments for botulism, plague, Ebola, and other diseases. HHS would coordinate SNS purchasing decisions with DHS and the Office of Management and Budget.

The HHS Secretary will play a critical role in authorizing the use of not yet approved and unlicensed products and technologies in an emergency. The routine development and approval processes for drugs, devices, and biological products are designed to provide safe and effective products to protect and enhance the public health. However, conducting thorough safety and effectiveness studies for submission to HHS and the Food and Drug Administration often takes the industry several years—too long for emergency situations. If the need arises, the HHS Secretary could issue an emergency authorization to use an investigational treatment after determining that there were no other alternatives available and that the known or potential benefits would outweigh the known or potential risks.

Isolation and Quarantine

To protect the public in the case of an outbreak of a highly contagious infectious disease, such as smallpox or plague, public health officials may decide to employ quarantine and isolation strategies, separately or together, depending on the situation. These practices can reduce the public's exposure to an illness by separating and restricting the movements of persons known to be infected or who are suspected of infection. Both practices may be carried out voluntarily, but, ultimately, government officials have the authority to impose quarantine and isolation, if necessary, to protect the public welfare.

Isolation removes people who are ill with contagious diseases from the general public and restricts their activities to stop the spread of a disease. *Isolation* is not required for patients with noncontagious diseases, such as anthrax. *Isolation:*

- Confines infected persons to their homes, hospitals, or designated health facilities
- Allows health care providers to provide infected persons with specialized care
- Is commonly used in hospitals for people with certain diseases, such as tuberculosis
- Is initiated mostly on a volunteer basis, but government officials at all levels have the authority to enforce it (CDC 2004c)

Quarantine separates people who have been potentially exposed to a contagious disease and may be infected but are not yet ill to stop the spread of that disease. *Quarantine:*

- Confines persons to their homes or community-based facilities
- Can apply to a group that has been exposed at a public gathering
- Can apply to persons who are believed to have been exposed while traveling, particularly overseas
- Can apply to an entire geographic area, in which case a community may be closed off by sealing its borders or by a barricade, known as a "cordon sanitaire"
- Is enforced at the state level and/or by CDC's Division of Global Migration and Quarantine

Although quarantine and isolation policies are commonly put into emergency plans, public health and government officials have not needed to use widespread quarantine and isolation measures in recent years in the United States. The last large-scale quarantine measures that were imposed in this country were used in the early 20th century to contain outbreaks of plague, yellow fever, and smallpox. Other countries have successfully used quarantine measures recently to control SARS. However, how quarantine is managed is unique to each country.

Legal Authority Related to Isolation and Quarantine

All levels of government have the legal authority to issue orders for isolation and quarantine. Generally, however, if an outbreak of an infectious disease occurs in a specific location, the authority for quarantine falls to the local authorities that govern that area. If the outbreak affects more than one community or has the potential to cross local boundaries, authority is passed on to the state. The federal government is primarily responsible for preventing diseases from being introduced and spread in the United States from foreign countries as well as interstate and national outbreaks.

The Division of Global Migration and Quarantine at CDC (http://www.cdc.gov/ncidod/dq/mission.htm) enforces regulations that are intended to prevent the introduction, transmission, and/or spread of communicable diseases from foreign countries into the United States. They operate eight full-staffed Quarantine Stations in international airports in the United States. These stations are responsible for monitoring all ports, seaports, and international airports for a given region. Officers at these stations also train immigration, customs, and agriculture inspectors to watch for ill persons and imported items that may have public health significance. During the SARS epidemic in 2003, quarantine officers took a number of actions to protect the health of the public, ranging from distributing health notices to air travelers with information about SARS to boarding planes to see if ill travelers had symptoms of SARS.

More detail on the legal authority related to isolation and quarantine can be found in "The Role of the Federal Government" section under the "Public Health Sources of Authority" heading (see p. 153).

National Disaster Medical System

The National Disaster Medical System (NDMS) is a federally coordinated system that provides medical services to help local and state agencies respond to major emergencies and disasters, including acts of terrorism. This system is made up of medical professionals who are specially trained and volunteer their services in case of an emergency as a supplement to local hospital systems. Some people describe the system as the "National Guard for Medicine."

NDMS (http://ndms.dhhs.gov) operates as a part of DHS, in partnership with HHS, the U.S. Department of Defense, and the U.S. Department of Veterans Affairs. The system is made up of specialized teams and a network of hospitals. In addition

to assisting communities in disasters, NDMS also supports military medical systems and U.S. Department of Veterans Affairs facilities in caring for casualties that are evacuated back to the United States from overseas conflicts. NDMS is operational in two situations: (1) if a National Emergency is declared, or (2) at the request of a state or local government.

The five types of NDMS teams are:

- Disaster Medical Assistance Teams
- Disaster Mortuary Operational Response Teams
- Veterinary Medical Assistance Teams
- National Nursing Response Teams
- National Pharmacy Response Teams

Each of these teams will be described in turn.

Disaster Medical Assistance Teams

- Eighty teams across the country comprised of local professional and paraprofessional medical personnel and logistical staff.
- Include four National Medical Response Teams, which are especially equipped and trained to deal with Weapons of Mass Destruction, and other specialized teams available to handle specific medical needs, such as burn and mental health emergencies.
- Designed as rapid-response units to supplement local services (e.g., triage, emergency care) until a situation is resolved or until additional resources—federal or private—can be activated.
- Deployed to affected areas with enough supplies to last 72 hours.
- May work at fixed or temporary medical sites.
- Each team managed by a sponsoring organization, such as a public health agency or a nonprofit group, that operates under a Memorandum of Agreement with DHS.
- Sponsor recruitment and organization of team members, arrange training, and coordinate the deployment of the team.
- Although designed to supplement services at the local, state, or regional level, may be used on a national basis.

Disaster Mortuary Operational Response Teams

- Ten regional teams formed to provide help to local officials in tasks relating to the recovery, identification, and burial of victims.
- One national team is specially trained to handle events involving Weapons of Mass Destruction.
- Members are private citizens with specialized expertise.
- Examples of types of team members include: funeral directors, medical examiners, coroners, and pathologists.
- Include two Disaster Portable Morgue Units, which are complete morgues that can be deployed to an affected site.

Veterinary Medical Assistance Teams

- Five nationally deployable teams of private citizens who provide veterinary care following major emergencies.
- Examples of tasks include the following:
  - Medical treatment for rescue animals, farm animals, and pets
  - Tracking and assessment of disease in animals
  - Animal decontamination
- Examples of types of team members include:
  - Clinical veterinarians
  - Veterinary pathologists
  - Veterinary technicians
  - Microbiologist/virologists
  - Epidemiologists
  - Toxicologists

National Nurse Response Teams

These teams are currently being formed to assist with mass vaccinations and provide specialized services in case the nation's supply of nurses is overwhelmed during a major emergency. There will be 10 regional teams, which will each consist of approximately 200 civilian nurses.

RAPID RESPONSE REGISTRY

As part of the response to an emergency event, CDC's Agency for Toxic Substances Disease Registry (ATSDR) may establish and maintain a Rapid Response Registry (RRR) of people exposed to a terrorist or other emergency event affecting public health within the United States and its territories. RRR will follow up with registrants over time to determine if there are any health problems that can be linked to the event.

ATSDR has been identified as the lead agency in establishing an event-related registry of victims and exposed population and will initiate RRR within 8–12 hours after an event. ATSDR will deploy field supervisors and data collection teams to the site of the event, and begin enrolling on an urgent basis all people who were exposed or potentially exposed. RRR can respond to any size and type of agent.

National Pharmacy Response Teams

Ten regional teams are being formed to help with emergency situations that may require the assistance of large numbers of pharmacy professionals, such as mass vaccination. Members will be sponsored by the Joint Commission of Pharmacist Practitioners and work in partnership with DHS.

Administration of Teams

When activated, members of NDMS teams are considered federal employees and are paid for their service. They are required to maintain the appropriate licensures for their disciplines, and some are required to stay current in treatment recommendations for diseases related to Weapons of Mass Destruction and to complete Web-based training in disaster and terrorism response.

Federal Coordinating Centers

In addition to the five types of teams, NDMS also coordinates a network of approximately 2,000 hospitals to assist in a disaster. NDMS relies on the voluntary assistance of accredited hospitals across the country—usually those with more than 100 beds and located in large metropolitan areas. Federal Coordinating Centers recruit these hospitals to commit a number of their acute-care beds for NDMS patients, if needed. If a hospital admits NDMS patients in an emergency, it is guaranteed reimbursement by the federal government.

In the case of a major disaster, the Federal Coordinating Centers may coordinate the evacuation or transport of patients to NDMS network hospitals in unaffected areas. These activities are coordinated with the U.S. Department of Defense, which would be responsible for transporting patients over long distances.

Other Supplementary Personnel and Resources

In response to a public health emergency, the federal government may dispatch personnel from the Epidemic Intelligence Service (EIS), the Commissioned Corps Readiness Force, or the Medical Reserve Corps.

EIS (http://www.cdc.gov/eis) is a 2-year postgraduate program of service and on-the-job training for health professionals interested in epidemiology. EIS, which is managed by HHS/CDC, was developed more than 50 years ago to defend the nation against biological warfare but also provides surveillance and response units for all types of outbreaks. Medical doctors, researchers, and scientists work in a range of subject areas, including infectious diseases, and are supervised by experienced epidemiologists at CDC and local and state health departments.

The Commissioned Corps of the U.S. Public Health Service (http://www.usphs.gov) is a uniformed service with a number of programs to help promote the health of the nation. It includes a variety of health professionals, including physicians, dentists, pharmacists, nurses, veterinarians, and other scientists and professionals. The Commissioned Corps Readiness Force is a subset of the Commissioned Corps that may be sent to respond to public health emergencies.

The Medical Reserve Corps (http://www.medicalreservecorps.gov) are teams of local volunteer medical and public health professionals who have offered to contribute their skills and expertise during times of community need. The Medical Reserve Corps program office is within the HHS Office of the Surgeon General, but the volunteer teams are operated out of local Citizen Corps, a national network of volunteers concerned with preparing their communities for disasters of all kinds.

Red Cross

The Red Cross (http://www.redcross.org) is another key player in responding to a public health emergency. The Red Cross is a nonprofit humanitarian organization led mostly by volunteers and has been providing disaster recovery assistance to Americans since the 1880s. Although not a government organization, the Red Cross was given authority through a Congressional Charter in 1905 to provide assistance in disasters, both domestically and internationally. As a result, Red Cross Chapters work closely with federal, state, and local governments to respond to disasters. The following are some of the services offered by the Red Cross in a disaster:

- Emergency first aid
- Health care for minor injuries and illnesses in mass-care shelters or other sites
- Supportive counseling for victims and those affected by the event
- Personnel to assist in the temporary infirmaries, immunization clinics, morgues, hospitals, and nursing homes
- Assistance with meeting basic needs (e.g., food, shelter)
- Provision of blood products

THE THREAT OF EMERGING INFECTIOUS DISEASES

With the development of antibiotics, other drugs and vaccines, vastly improved sanitation, and better control of insects and other animals that can harbor and spread disease, great strides have been made in public health over the last century. In the 1960s, it was even thought that the long era in which infectious diseases inflicted high mortality might be drawing to a close. But increases in international travel, the number of people living in urban areas, and the adaptability of microbes have given cause for increased concern in recent years.

Also of increasing concern to scientists and the medical community are infectious diseases that have previously infected only animals but are now infecting humans. Because such diseases are relatively unstudied in humans, these species-jumping or zoonotic infections have the potential to become serious problems quite rapidly. In addition, it is difficult to predict when or where such a disease might emerge. Many factors may cause these jumps, including contact between animals and humans, mutations of a microbe, and changes in the environment. The recent increase of these sorts of infections may be due to many factors, including that increasingly larger numbers of people and animals are coming into contact with each other and that modern transportation allows people to quickly travel around the globe and rapidly spread infections widely (Murphy 1998). As mentioned previously, many of these outbreaks have characteristics similar to bioterror attacks and may be investigated as such in their beginning stages.

The following emerging diseases (all of which are thought to have animal origins) are among those that the public health community continues to try to understand and manage.

EBOLA (A VIRAL HEMORRHAGIC FEVER)

Ebola is highly contagious and usually fatal. Most cases have occurred in Central Africa. The first Ebola epidemics occurred in Zaire and Sudan in 1976 and outbreaks have occurred in the last decade in Cote d'Ivoire, Zaire, Gabon, Uganda, the Congo, and Sudan. According to WHO, 257 deaths were reported between December 2002 and 2003. Outbreaks are thought to begin with human contact with an infected animal. Once the first person is infected, the disease can then be spread from person to person through infected blood or secretions, or via contaminated objects, such as needles. Researchers continue to try to pinpoint which animals act as hosts to this virus. Knowledge about the host and about how Ebola spreads will help prevent future outbreaks. Researchers are alsocurrently working on developing a vaccine and possible antiviral drug treatments for Ebola.

In 2001, at the time of an active Ebola outbreak in Uganda, Africa, there was a "false alarm" concerning a suspected viral hemorrhagic fever case in Ontario, Canada. A patient who had traveled from Africa by plane was hospitalized with an infectious disease that had symptoms consistent with those of a viral hemorrhagic fever. If this diagnosis had been confirmed, this would have been the first viral hemorrhagic fever case ever seen in North America. Health Canada and CDC worked together on the case and quickly coordinated their public health messages and recommendations. Fortunately, the test results were negative for any viral hemorrhagic fever, but this case illustrates the potential global threat of newly emerging infectious diseases.

More detailed information on viral hemorrhagic fevers, like Ebola, can be found in the "Biological Agents" section (see p. 39).

SARS

SARS (severe acute respiratory syndrome) is a viral respiratory illness caused by a coronavirus. The first confirmed cases occurred in Guangdong Province in China in November 2002. These 11 independent cases appear to have resulted from human consumption of wild animals. The virus quickly evolved to a form that could be transmitted among humans. In the 2003 outbreak, a total of 8,098 people worldwide contracted SARS and 774 died. Most SARS cases were in Asia. There were eight lab-confirmed cases of SARS in the United States, but none of these individuals died from the disease. Those affected had all traveled to parts of the world where SARS outbreaks were occurring. By late July 2003, no new cases were being reported and WHO declared that the global outbreak was over. In April 2004, there were several cases of SARS in China that were laboratory acquired infections. CDC now has a plan in place to respond quickly if SARS recurs. Tremendous progress has been made in the development of experimental SARS vaccines. For more information on SARS, including current information on SARS transmission throughout the world, see CDC's SARS Web site (http://www.cdc.gov/ncidod/sars) or WHO's SARS Web site (http://www.who.int/csr/sars/en/).

WEST NILE VIRUS

West Nile virus (WNV) is transmitted by mosquitoes from birds to humans or other animals. Humans, horses, and some species of domestic and wild birds are susceptible to WNV. The most serious form of the disease is viral encephalitis, which is an inflammation of the brain. In 2003, 2.6 percent of infected humans developed severe symptoms. No human-to-human transmission has been reported.

The first known occurrence of WNV in humans was in the West Nile District in Uganda in 1937. There was an outbreak among the elderly in Israel in 1957, and horses were stricken in Egypt and France in the early 1960s. WNV first appeared in North America in 1999. According to CDC, in 2003, 9,862 cases were documented in humans in the United States and 264 people died. Efforts are now underway to develop specific treatments and different vaccine approaches to manage WNV.

In 2002 and 2003, a small number of cases of WNV were acquired through blood transfusions. Tests were developed to screen blood for WNV and as of July 2003, every blood bank in the United States was screening donated blood for WNV. In addition, blood banks started screening out donors with recent possible symptoms of WNV (i.e., fever, headache). However, since the current testing procedures cannot catch every infected blood donation, scientists continue to work on better tests and testing procedures.

More information on WNV can be found at http://www.cdc.gov/ncidod/dvbid/westnile/index.htm.

BOVINE SPONGIFORM ENCEPHALOPATHY ("MAD COW" DISEASE)

Bovine spongiform encephalopathy (BSE), which is commonly known as "mad cow" disease, was a concern in the United States in the winter of 2003–2004 after the discovery of a single dairy cow in Washington state with BSE. This cow's birth was traced to a farm in Alberta, Canada. BSE is a progressive neurological disorder that is typically spread in cows when they eat animal feed containing neural tissue (e.g., spinal cords, brain tissue) of BSE-infected cows. Feed bans were implemented in North America in 1997, which prohibited the use of this kind of cattle feed. The majority of BSE cases have appeared in Great Britain, peaking in the mid-1990s. The concern about BSE is that it appears linked to a neurological disease in humans called variant Creutzfeldt-Jackob disease (vCJD). It is thought that humans may be exposed in a way similar to cows' exposure—if they eat meat products that contain contaminated bone, spinal cord, or brain tissues. In a few cases, people have been infected by contaminated blood transfusions or tissue or organ transplants.

The BSE risk to humans, particularly in the United States, is considered low. As of December 1, 2003, there had been 153 vCJD cases reported worldwide—143 of them in Great Britain (CDC 2003a). CDC has increased surveillance, however, to monitor for cases of vCJD in the United States and the U.S. Department of Agriculture has enhanced regulations, inspections, and surveillance related to BSE.

THE THREAT OF PANDEMIC INFLUENZA

Influenza or flu viruses routinely cause epidemics of disease every winter that can cause illness in about 10–20 percent of the population in the United States. Although these routine influenza epidemics cause an average of 36,000 deaths and 200,000 hospitalizations per year in the United States, healthy adults are usually not at high risk for complications. The groups that are at risk for complications include the very young, pregnant women, older adults, and those with chronic medical conditions. Typically, flu shots are available and effective against these types of influenza outbreaks that occur each winter, although persuading people most at risk to get annual vaccinations remains a challenge. Flu viruses are continually circulating around the world and mutate or change over time. This is the reason that the vaccine is updated to include current viruses each year and that people who want to be protected against the flu need to get a new flu shot each year.

Pandemics of influenza are explosive global events in which most, if not all, persons worldwide are at risk for infection and illness. In past pandemics, influenza viruses have spread worldwide within months. With increased globalization, a new pandemic could cross the globe within weeks or perhaps even days. Pandemic viruses have historically infected one-third or more of large populations and have led to tens of millions of deaths.

Pandemics occur when there is a major change in an influenza virus, resulting in a new strain that most of the world has never been exposed to, therefore leaving most individuals susceptible to infection. Unlike the gradual changes that occur in the influenza viruses that appear each year during flu season, a pandemic influenza virus is one that represents a major, sudden shift in the virus' structure that increases its ability to cause illness in a large proportion of the population. This kind of change is called an "antigenic shift."

There are two types of influenza viruses: type A and type B. Type A viruses can be found in many types of animals, while type B viruses circulate only among humans. While a routine epidemic can involve either type of virus, antigenic shift can only occur with influenza A viruses. One way that an antigenic shift can occur is through pigs. Pigs can be infected with both avian and human influenza viruses. If pigs are infected with viruses from different species at the same time, it is possible for the genes of these viruses to mix and create a new virus. Humans would not have any immune protection to such a virus and could be infected in large numbers (CDC 2004d) The rare appearance of a flu pandemic virus would likely be unaffected by currently available flu vaccines that are modified each year to match the strains of the virus that are known to be in circulation among humans around the world.

During previous influenza pandemics, large numbers of people were ill, sought medical care, were hospitalized, and died. Three major influenza pandemics occurred during the 20th century. The most deadly influenza pandemic outbreak was the 1918 Spanish flu pandemic, which caused illness in roughly 20–40 percent of the world's population and more than 50 million deaths worldwide. Between September 1918 and April 1919, approximately 675,000 deaths from the Spanish flu occurred in the United States alone (HHS 2004a). In 1957, the Asian flu pandemic resulted in about 70,000 deaths. The most recent influenza pandemic occurred in 1968 with the Hong Kong Flu outbreak, which resulted in nearly 34,000 deaths in the United States. Although the virus involved in the 1968 outbreak was a dangerous virus, experts believe that fewer deaths occurred in the United States than in previous outbreaks for several reasons:

- The virus was similar to the virus that appeared in the 1957 outbreak, and some people already had immunity
- The peak of the outbreak occurred during December when children were out of school, so the virus was not widely transmitted among school-aged children
- Medical care and available treatments for complications had improved since the 1957 outbreak (HHS 2004b)

Although no one can predict when the next pandemic will occur, public health scientists believe that the risk of an influenza pandemic is greater now than it has been in decades.

AVIAN INFLUENZA

One type of influenza A virus that is of concern to many public health officials is often called avian flu or bird flu. Both the 1957 and 1968 pandemics are thought to have had avian origins. Avian flu is caused by a group of influenza viruses that circulate among birds. Avian flu is highly contagious among

birds, particularly domesticated birds, such as chickens. It is thought that human cases have resulted from contact with infected birds. In the past, quarantine and depopulation (or culling) and surveillance around affected flocks have contained outbreaks. Among humans, symptoms range from conjunctivitis to a flu-like illness that includes severe respiratory distress and pneumonia. There has been no evidence of sustained human-to-human transmission of avian flu, although there have been a few isolated cases of transmission between family members. However, because influenza viruses have the potential to change and gain the ability to spread easily between people, monitoring for human infection and person-to-person transmission is important.

Several humans have been infected with avian flu since 1997. The first documented human case was identified in 1997 in Hong Kong. Both humans and chickens were infected. Eighteen people were known to be infected and six died. To prevent further spread of the disease, public health authorities killed more than a million chickens. A second outbreak occurred in Hong Kong in 1999; two children were infected but both recovered. Three outbreaks occurred during 2003. Two separate cases in Hong Kong and a third outbreak occurred among poultry workers and their families in the Netherlands. Eighty-four people were infected and one died. Avian flu is a continuing threat. In early 2004, a new outbreak of avian influenza occurred in humans in Thailand and Vietnam. It also appears that cats may become infected from infected birds and that those cats may then transmit the disease to other cats.

During 2004, avian flu cases were spread to unprecedented levels in both poultry and humans in several countries in Asia. The threat to the United States is considered uncertain at this time. While poultry imports from Asia are limited (mostly feathers or processed or cooked products, which are considered to be low risk), it is possible that in the future an individual infected with a new avian influenza virus that is able to spread from person to person could travel to the United States (Center for Emerging Issues 2004).

One important reason for the current heightened concern about influenza viruses is that avian influenza has become endemic in many species of birds throughout Asia. Therefore, the threat of an avian flu pandemic is not diminishing. Scientists will need to continue to carefully monitor avian flu epidemics in Asia each year to make sure that they remain contained and that the virus has not transformed into a virus that can be easily transmitted from person to person.

Preparing for a Pandemic

Prepandemic planning is essential to minimize the effects should an influenza pandemic occur. Although some of the planning activities for terrorism and other public health emergencies are relevant to an influenza pandemic (e.g., strengthening surveillance systems), planning is also underway that is more specific to influenza. HHS' current Pandemic Influenza Preparedness and Response Plan (http://www.hhs.gov/nvpo/pandemicplan) (HHS 2004c) provides guidance to national, state, and local policymakers and health departments for public health preparation and response in the event of a pandemic influenza outbreak.

At the federal level, health officials are also conducting a number of other activities in preparation for the next pandemic, including international surveillance activities, vaccine development and research, and antiviral drug stockpiling and research. Among other activities, resources are being allocated to expand vaccine production as needed and add influenza antiviral drugs to SNS. Research is also being conducted on new influenza vaccines, more effective antiviral drugs, and ways to rapidly sequence the genes of influenza viruses.

If a pandemic were to occur, the federal response activities would depend to an extent on the stage of the pandemic. For example, the activities are different if scientists have discovered a new influenza strain in one person in another country than if a number of people in the United States are ill with a new strain of influenza. The kinds of activities that the federal government might be involved in include:

- National and international surveillance to identify people who have the virus and where outbreaks are occurring
- Rapid development, licensure, and production of new vaccines
- Implementing of programs to distribute and administer vaccine
- Determining how antiviral drugs could be used to combat the current flu strain and target drug supplies

- Implementing control measures to decrease the spread of the disease (e.g., infection control in hospitals, screening travelers from affected areas)
- Communicating with the public, health care providers, community leaders, and the media about the status of the pandemic and the response

States are also expected to develop their own plans to deal with the local aspects of planning for and response to a potential influenza pandemic. Some examples of what these plans would include are the state and local perspective on:

- Surveillance activities
- Vaccine management (distribution and administration)
- How to acquire and use antiviral agents
- How to implement community control measures (e.g., school closings, isolation and quarantine)
- Emergency response (e.g., delivery of medical care, maintenance of essential community services)

Local preparedness will be an essential determinant of how communities do in the early months of a pandemic. Communities are encouraged to plan now for the crucial period when a pandemic has stuck, but when there are not yet adequate supplies of vaccines or antivirals. Three tasks should be considered by communities in this process:

1. Reducing social contact to slow the spread of the virus
2. Treating those who become ill
3. Sustaining civic life in the face of greatly increased morbidity, mortality, and fear

Examples of the many issues a community should consider are: how to use volunteers, especially people who have recovered and are, therefore, immune; how to educate children if schools were closed; and how essential businesses would operate.

More detail on possible federal and state preparedness and response activities can be found in HHS' Pandemic Influenza Preparedness and Response Plan (http://www.hhs.gov/nvpo/pandemicplan).

SOME DIFFERENCES BETWEEN TYPICAL INFLUENZA OUTBREAKS AND PANDEMIC INFLUENZA OUTBREAKS

TYPICAL INFLUENZA	PANDEMIC INFLUENZA
Yearly occurrence.	Rare occurrence (last one was in 1968).
Virus undergoes gradual change from previous years.	Major, sudden virus shift in virus structure (antigenic shift).
Previous exposure to similar viruses may provide some protection.	Little or no previous exposure in the population to similar viruses.
Healthy adults usually not at high risk for complications.	Entire population may be at risk for complications.
Vaccines may be developed in advance to combat the virus.	Vaccines cannot be developed until virus strain appears. Some antiviral medications may be effective.
Approximately 5–20 percent of Americans get the flu each year and approximately 36,000 die from the disease.	Percentages of the population that would be infected by a pandemic influenza virus and die from it are hard to predict ahead of time but would be significantly higher than a typical flu season.
Symptoms include fever, cough, runny nose, and muscle pain.	Symptoms could be more severe, including shortness of breath, acute respiratory distress, pneumonia, and organ failure.

A JOURNALIST'S GUIDE
To Communicating Health Risk Numbers Effectively *by Vincent T. Covello, Ph.D.*

ESSAY

Introduction

There are many ways to use numbers to help explain public health risks. For example, numbers can be used to explain:

- Concentrations—such as parts per million or billion
- Probabilities—the likelihood of an event
- Quantities—such as how many spores of anthrax were in a letter
- Comparisons—such as comparing how dangerous something is compared to something else (e.g., twice as deadly…)

But unfortunately, numbers can also be very confusing and can sometimes be misinterpreted or presented in ways that inadvertently raise levels of concern and alarm. For example, if a substance is described as being "twice as deadly as cobra venom," that is not the same thing as "like being bitten by two cobras." Why not? Because the first comparison is about how lethal or poisonous the substance is, and the second is about the amount of poison someone might be exposed to.

Here are some other issues to be aware of when using numbers to help describe public health risks.

Framing. The impact of a health risk number changes depending on how the risk number is framed, or positioned. For example, describing "lives lost" versus "lives saved" can have a profound effect on how people respond to the information. In one classic study, doctors were presented with a hypothetical choice between two cancer therapies with different probabilities of success and failure. Half were told about the relative chances of dying while the rest had the same information presented in terms of survival rates. The change in framing—even though the results were the same—more than doubled the number of doctors choosing one alternative.

Absolute Versus Relative Risk. Responses to risk messages—especially when communicating increases or decreases in risk—depend critically on whether probabilities are presented in absolute terms ("the probability was 2 percent and is now 4 percent") or relative terms ("the probability has doubled" or "this group suffers twice the normal risk of …"). The latter can be seriously misleading. Information about relative risks can result in misperceptions if information about baseline probabilities is not made clear.

Scale. Scales can also radically change perceptions of risk numbers. For example, in communicating concentrations, the expression "6 parts per billion" sounds a great deal larger than 0.006 parts per million, even though they are the same. Scale is also a factor in communicating probabilities. For example, a risk agent that is expected to result in the death of 1.4 people in 1,000 can equally be expressed as:

- The risk is 0.0014.
- The risk is 0.14 percent.
- In a community of a thousand people, we could expect 1.4 to die as a result of exposure.

Although these alternatives are equivalent, their meaning to, and effect on, audiences are not. The first term may make the risk seem smaller, whereas the last term may make the risk seem larger. Confusion can often be avoided by embedding risk numbers in words that help clarify their meaning or translating the numbers into a comparison that people can imagine. For example, "a risk of 0.047" is comprehensible to only a few people. By comparison, it is much easier to understand that roughly 5 people in an auditorium of 100 would be affected. This embedding process can also be accomplished through visuals, including graphs, charts, animation, and pictures. But as mentioned earlier, embedding must be done carefully so that appropriate and accurate comparisons are made.

Estimates. Many risk numbers—for example, risk probabilities and mortality rates—are estimates based on modeling and not real life experience. Because they are based on models, many risk numbers often have substantial uncertainties and margins of error. In some cases, uncertainties in risk estimates arise from the use of different assumptions and extrapolations. In other cases, uncertainties arise because the risk is very low, because data are still preliminary, because diagnosis is difficult, or because measurement is difficult.

Because of uncertainties, one approach to communicating risk numbers is to report the most likely estimate of risk.

A second approach is to report the upper-bound, "worst case," or maximum estimate of risk. A third, and more complete approach, is to report the most likely estimate, along with the highest and lowest estimates. For example:

"Our best estimate is *a*. Our cautious, worst-case estimate is *b*. The highest estimate we have heard, from scientists at University X, is *c*."

Context. In presenting risk numbers, it is often useful to explain how the risk numbers were obtained. For example, it is often useful to explain how mortality rates and probabilities (1 in a million) are calculated. Demystifying the risk assessment process has several benefits. Perhaps most importantly, it enables the presenter to make points that may be important for people to understand. For example, it allows the presenter to make the point that the presence of a risk agent does not necessarily signify a significant health risk. This point is often extremely difficult to communicate. For a risk agent to pose a risk, *an exposure must occur.* There must be a way for the risk agent to get from where it is to where people or the things they value are.

A second critical point for the public to understand about risk assessment is that after a route of exposure is established, the next important question is the concentration of the risk agent that may reach people. Concentration amounts of exposure are typically far lower than the concentration amounts at the source. Moreover, they often become even lower with the passage of time and distance. Risk assessors consider not only *whether* a risk agent is present but also *how much* is present.

Comparisons. Risk numbers are often communicated as part of a comparison. The goal of comparisons is to make the original risk number more meaningful by comparing it to other numbers. For example, small probabilities are often difficult to conceptualize: just how small, really, is "1 in 10 million" or "a probability of 0.00015"?

Comparisons, although useful for putting numbers in perspective, can create their own problems. For example, use of the concentration comparisons found in table 2 can lead to disagreements. The statement that 1 part per million of a contaminant is equal to one drop in an Olympic-size swimming pool or one drop of vermouth in a million-gallon martini is typically intended to help the reader understand how "small" an amount exists. However, for some individuals, such comparisons represent a subtle way of trivializing the problem and prejudging acceptability. Furthermore, concentration comparisons can sometimes be misleading because risk agents vary widely in terms of the amount of the agent needed to sicken or kill someone.

Risk Comparisons. Comparing one risky thing to another helps people grasp how likely something is to cause harm compared to something else. Probabilities are only one of many kinds of information on which people base decisions about risk acceptability. Risk numbers cannot preempt those decisions. *No explanation of a risk number will be successful if it appears to be trying to settle the question of whether a risk is acceptable*.

Although more research is needed, the most effective comparisons appear to be:

- Comparisons of the same risk at two different times
- Comparisons with a regulatory standard
- Comparisons with different estimates of the same risk
- Comparisons of the risk of doing something versus not doing it
- Comparisons of alternative solutions to the same problem
- Comparisons with the same risk as experienced in other places

All of the types of comparisons have some claim to relevance and legitimacy.

The least effective comparisons appear to be those that disregard the risk perception and outrage factors that people consider important in evaluating risks. The most important of these include voluntary versus coerced, natural versus human-made, familiar versus unfamiliar, not memorable versus memorable, dreaded versus not dreaded, chronic versus catastrophic, knowable versus unknowable, individually controlled versus controlled by others, fair versus unfair,

ESSAY (cont.)

morally irrelevant versus morally relevant, trustworthy sources versus untrustworthy sources, and responsive process versus unresponsive process.

Conclusion

In conclusion, as with any information contained in a news story, only health risk numbers that can be supported by reliable data should be selected. Some of the data manipulations discussed in this article are just simple transformations of the same number. However, other transformations can radically affect the way the audience hears, understands, and remembers the number.

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TABLE 1: VARIOUS ANNUAL AND LIFETIME RISKS (U.S. POPULATION ONLY)*

CAUSE OF DEATH OR HARM	ANNUAL RISK	LIFETIME RISK
Heart disease	1 in 300	1 in 4
Cancer (all forms)	1 in 510	1 in 7
Pneumonia	1 in 4,300	1 in 57
Plague	1 in 19,000,000	1 in 240,000
Anthrax (2001)	1 in 56,000,000	1 in 730,000
Suicide	1 in 9,200	1 in 120
Criminal homicide	1 in 18,000	1 in 240
Motor vehicle	1 in 6,700	1 in 88
Commercial aircraft	1 in 3,100,000	1 in 40,000
Passenger train	1 in 70,000,000	1 in 920,000
On the job	1 in 48,000	1 in 620
Accidental electrocution	1 in 300,000	1 in 4,000
Lightning	1 in 3,000,000	1 in 39,000
Shark attack	1 in 280,000,000	1 in 3,700,000

* These numbers vary from country to country. Individual risks vary.

Source: Ropeik, D. & Gray, G. (2002). *Risk: A practical guide to what's really safe and what's really dangerous in the world around you*. Boston, MA: Houghton Mifflin.

TABLE 2: CONCENTRATION COMPARISONS

UNIT	1 PART PER MILLION	1 PART PER BILLION	1 PART PER TRILLION
Length	1 in./16 mi.	1 in./16,000 mi.	1 in./16,000,000 mi. (a 6-in. leap on a journey to the sun)
Time	1 min./2 years	1 sec./32 years	1 sec./320 centuries (or 0.06 sec. since the birth of Jesus Christ)
Money	1 cent/$10,000	1 cent/$10,000,000	1 cent/$10,000,000,000
Weight	1 oz./31 tons	1 pinch salt/10 tons of potato chips	1 pinch salt/10,000 tons of potato chips
Volume	1 drop vermouth/80 "fifths"of gin	1 drop vermouth/500 barrels of gin	1 drop of vermouth in a pool of gin covering the area of a football field 43 ft. deep
Area	1 square ft./23 acres	1 square in./160-acre farm	1 square ft./the state of Indiana; or 1 large grain of sand on the surface of Daytona Beach
Action	1 lob/1,200 tennis matches	1 lob/1,200,000 tennis matches	1 lob/1,200,000,000 tennis matches
Quality	1 bad apple/2,000 barrels	1 bad apple/2,000,000 barrels	1 bad apple/2,000,000,000 barrels

Source: Rowe, W.D. & Hageman, F.J. (1984). *Evaluation methods for environmental standards*. Boca Raton, FL: CRC Press.

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BIOLOGICAL AGENTS

03

BIOLOGICAL AGENTS

GOAL OF THIS SECTION

To provide the best available scientific and medical information on selected biological agents that may be used by terrorists as weapons.

WHAT THIS SECTION INCLUDES AND WHY

- **Category A agents, as classified by the U.S. Department of Health and Human Services' (HHS) Centers for Disease Control and Prevention (CDC), are included because they are of the highest concern as potential threats. They have the potential for major public health impact and social disruption and are also known to have been studied by some countries for use in biological warfare.**
- **Category B agents, which are defined as a "second highest priority" by CDC, are also included. Although these agents are fairly easy to disseminate, they generally cause moderate illness and low death rates.**

WHAT THIS SECTION DOES NOT INCLUDE AND WHY

- **Category C agents, which are considered to be "third highest priority" by CDC, are not included because they are currently not major bioterrorism threats. However, these agents are emerging as infectious disease threats that CDC believes could, in the future, be engineered to produce biological weapons. Examples of Category C agents include yellow fever, drug-resistant tuberculosis, and hantaviruses.**

Please note: Information on the use of personal protective equipment (e.g., biohazard suits and masks) can be found in the "Self-Care for Media" section (see p. 157).

BIOLOGICAL AGENT OVERVIEW

- The threat from **biological agents** arises when naturally occurring microbes are *weaponized*—harnessed and modified to cause disease or even kill many people.
- Organisms can be used in their naturally occurring state or they may be able to be modified to increase virulence and/or render the disease they cause resistant to treatment.
- To determine if an outbreak may be bioterrorism, scientists will look for the following characteristics:
  - A large number of cases appearing at the same time, particularly in a discrete population (e.g., people from the same town, people who attended the same event)
  - A large number of cases of a rare disease or one considered a bioterrorism threat (e.g., plague, tularemia)
  - More severe disease manifestation than typical for a given disease and/or an unusual route of exposure
  - A disease that is unusual in a given place or is out of season (e.g., a flu outbreak in the summer in the United States)
  - Multiple simultaneous outbreaks of the same disease or different diseases
  - A disease that affects animals as well as humans
  - Unusual disease strains or uncommon antibiotic resistance to an organism

Although some of these characteristics may be true of a naturally occurring outbreak, they will generally signal that the outbreak needs to be closely scrutinized.

UNDERSTANDING BIOLOGICAL AGENTS

The first step in understanding biological agents and how they affect the human body is a review of associated terminology.

Infectious Diseases

- *Infectious diseases* are caused by the invasion of the body by harmful microorganisms.
- Microorganisms multiply and make the person sick by attacking organs or cells in the body.

> **"JOURNALISTS FROM LARGE CITIES TO SMALL TOWNS** could wake up and be on the front lines of a new kind of warfare involving radiological, chemical, or biological agents with all the associated hazards or responsibilities. There's a whole new dimension here that's never existed before."
>
> *Peter Van D. Emerson, Senior Associate*
> *Harvard University's John F. Kennedy School of Government*
> *"Girding for Terror," American Journalism Review, April 2003*

- These harmful microorganisms include viruses and bacteria, as well as certain other microscopic organisms, and are sometimes called *pathogens*.
- There is usually a lag time, called an *incubation period*, between when a person is infected and when the symptoms appear.
- People can become infected with these diseases in any number of ways, including consuming contaminated water or food, being bitten by insects or animals, or inhaling or touching the microorganisms or their spores.
  - Spores are produced by certain bacteria and plants. Like seeds, spores do not grow until the environment is conducive for them to do so. They are highly resistant to heat and other environmental factors.
- All of the diseases discussed in this section are considered infectious diseases. Illnesses caused by chemical agents (see "Chemical Agents" section [p. 95]), by contrast, are not infectious diseases.

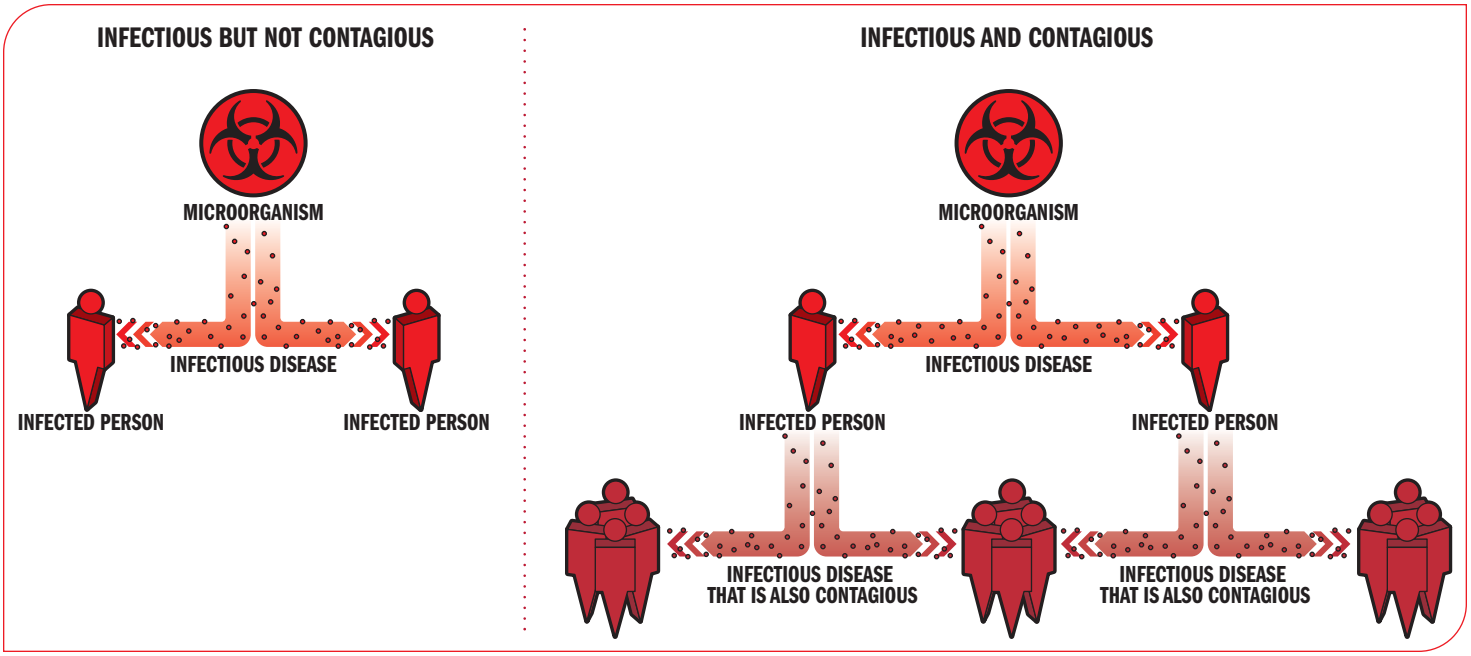
Contagious Diseases

- A *contagious disease* is an infectious disease that can be "caught" by a person who comes into contact with someone who is infected. Not all infectious diseases are contagious.
- Exposure to a contagious disease usually happens through contact with the infected person's bodily fluids or secretions, such as a sneeze.
- Depending on the disease, the level of contact required to pass on the illness could be as casual as water droplets in the air from a cough (e.g., smallpox).
- The level of contagiousness has nothing to do with how serious the resulting disease may be. For example, pneumonic plague and the common cold are both highly contagious, but pneumonic plague is obviously a much more serious disease.
- There are some infectious diseases that are not contagious at all, no matter how close the contact with an infected person (e.g., botulism, tularemia).

Toxins

- *Toxins* are the poisonous, usually protein-based, substances produced by microorganisms (bacteria, mold, virus) in certain infectious diseases.
- Microorganisms use these toxins as the specific weapons for attacking organs or cells in the body.
- *Antitoxins* are medications that attempt to neutralize a toxin without necessarily killing the bacteria, mold, or virus that is producing the toxin.
- Many different types of antitoxins exist because a specific antitoxin will usually only fight a particular kind of toxin.
- Although toxins are usually classified as being biologically produced, common language often refers to the poisons created by nonliving chemical agents as *chemical toxins*.

FIGURE 3–1: INFECTIOUS DISEASE: SOMETIMES CONTAGIOUS, SOMETIMES NOT



Bacteria and Viruses

› Both *bacteria* and *viruses* can cause infectious diseases.

Bacteria

› *Bacteria* are one-celled microorganisms that are capable of multiplying.

› Not all bacteria are harmful (e.g., bacteria turn milk into cheese).

› *Antibiotics* are medications that can be used to kill harmful bacteria.

› Some bacteria can develop resistance to antibiotics, making the medications less effective.

› Hospitals will typically have supplies of antibiotics known to be effective against most Category A and B bacterial agents.

Viruses

› *Viruses* are simpler than bacteria, often made up merely of a bit of deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) that is surrounded by a protective coat of protein.

› Viruses are parasitic in nature and unable to multiply without *host cells*—cells within a person's body that the viruses invade and use to multiply.

› Antibiotics are not effective against viruses.

› Some antiviral medications do exist, but many that might help against Category A agents are still in clinical trials. Consult HHS' National Institute of Health's National Institute for Allergy and Infectious Diseases' (NIAID) Web site (http://www2.niaid.nih.gov/biodefense) for ongoing research in this area.

DELIVERY OF BIOLOGICAL AGENTS

The ability to successfully deliver a biological attack depends on:

› The type of agent or organism

› The method of dissemination

› The weather (e.g., wind speed, humidity, time of day, precipitation, temperature):

- Wind speed affects how widely an agent can be spread
- Humidity can cause decomposition of an agent
- Precipitation can cause clumping, making fine particles more difficult to inhale

Routes of Entry

Biological agents can enter the body through:

BACTERIA	VIRUSES
• One-celled microorganisms that contain several components within the single cell.	• Bits of DNA or RNA.
• Some bacteria can also exist as spores that help them survive harsh conditions. Spores can germinate to become full-fledged bacteria; this is the case with anthrax.	• Viruses need to infect living cells to survive and multiply.
• Antibiotics can be used to kill bacteria.	• Antibiotics do not affect viruses; some antiviral medications exist.

- Absorption
- Inhalation
- Ingestion
- Injection

Delivery Methods

Biological weapons can be prepared for delivery as a weapon in wet or dry form:

- In dry form, agents are more stable and refinement is easier
- In liquid form, agents are less stable, require refrigeration, and are difficult to refine to small particle sizes

Biological weapons can be delivered by:

- Wet or dry aerosol sprayers
- Explosive devices
- Transmission through insects, animals, or humans
- Introduction into food, water, or even medications
- In or on objects, in some cases (e.g., anthrax in envelopes)

Effectiveness of Release

The effectiveness of a biological release depends on:

- The particle size and its potency (for example, in an aerosol release, the size must be between 1 and 5 microns to be inhaled and cause illness) (Note: 1 micron is one millionth of a meter. A strand of hair ranges between 20 and 200 microns in width.)
- How well the agent survives in the environment
- Weather conditions

TESTING FOR BIOLOGICAL AGENTS

Quick diagnosis and treatment of a patient exposed to a biological agent are key to saving that patient's life. A biological attack may go unnoticed until large groups of people begin exhibiting symptoms, which makes prompt diagnosis even more critical. But getting a quick medical answer is complicated by the fact that currently there is no single test that can diagnose whether a person has been exposed to biological agents. There are clinical trials under way, however, on better testing methods.

To look for evidence of biological agents, physicians will take blood or other samples to be tested at clinical laboratories. As the clock is ticking, the sample must be collected and sent to the appropriate lab for analysis. However, it takes time to isolate the bacteria, toxin, or virus from the sample. This timeframe can stretch from hours to days, depending on the agent, the amount of exposure, the proximity and capabilities of the lab, and the time the test(s) take. The following list provides descriptions of the types of tests that may be run:

- **Environmental testing** is examining a building or an area for the presence of a biological or chemical agent. Testing is usually a two-step process. Using anthrax as an example, if the sample contains a large amount of the bacteria (*Bacillus anthracis*), a positive reading may come back within minutes. However, this quick initial result from the scene may be what is called a false positive result, so a more reliable test must be done by a more sophisticated laboratory to confirm the results. The confirmation test can take up to 72 hours depending on how fast the bacteria grow and can be positively identified.

SHOULD I KEEP SUPPLIES OF CIPRO AND KI IN MY MEDICINE CABINET AT HOME?

After the anthrax attacks of 2001, many people wanted to obtain certain medical supplies, such as Cipro (ciprofloxacin hydrochloride) or KI (potassium iodide) tablets, to have on hand in case of an emergency. Although people may feel comforted by keeping these supplies at home, the truth is that personal stockpiling of such products can actually do more harm than good. Because we do not know how a future attack will unfold, it is impossible to know what type of medical response will be best. Here are a few specific concerns that public health officials have about the stockpiling of medical supplies:

- **False sense of security. Believing that one has what he or she needs at home can result in not getting necessary medications if they are really needed. For example, Cipro is a prescription antibiotic that was the drug of choice in the 2001 anthrax attacks. It may be useful for combating some kinds of biological agents but may not be the best drug to use for all bacteria. And, if the drug has been sitting in a medicine cabinet for several years, it may no longer be potent.**
- **Some supplies may be ineffective against a given threat. KI, for example, can protect the thyroid gland from exposure to radioactive iodine, which may be released in some radiological incidents, but this does not help protect against other forms of radioactivity that may come with an attack. In addition, not all attacks will involve the release of radioactive iodine. Some communities with nearby nuclear reactors have made KI available to residents, but that doesn't mean that maintaining a ready stock of KI is right for every community and every family. If an attack with a dirty bomb or other radiological device took place, KI may not be helpful, and people may mistakenly think that they are protected.**
- **Side effects and adverse reactions. Certain medications, including Cipro, can cause an allergic reaction or severe side effects in some people. Taking these drugs without proper guidance can increase the risk of possible side effects and adverse reactions.**

Public health officials do recommend that people have other supplies on hand, including food, water, medications taken routinely, and a battery-powered radio. A more detailed list of supplies can be found in appendix F (see p. 242). In an emergency, public health officials will let community members know through the media what is going on and where they should go to obtain necessary medical supplies.

- A **nasal swab** is an environmental test that may be used to assist in a public health investigation to determine the presence of a bioterrorism agent in an area or building. Nasal swabs are not used to determine if a person is infected by a given agent.
- A **culture** is a method for growing an organism in the lab (for example, in a Petri dish). A culture can help in identifying a bacteria or virus. Cultures are the most readily available technology for clinical diagnosis of a suspected case of bioterrorism but can be time consuming to complete.
- A **blood culture** is a test that looks for bacteria or viruses in the blood. Blood is drawn from a patient, and the sample is sent to a special laboratory for analysis. The sample is incubated, or kept in a warm place, at a certain temperature, and in this controlled environment, the bacteria grow and are isolated from the blood for easier identification.
- "Media" are the nutrient mixes used to grow organisms in a lab. **Selective media** are used to identify an organism by giving it or depriving it of certain nutrients. For example, selective agents can be added or removed, which "poison" some organisms while allowing others to grow.
- **Gram staining** uses dyes to make a bacterial cell stand out for identification. A specimen is put on a slide and a four-part staining procedure begins. This test may produce results in less than an hour, but it is not specific enough to definitely identify the organism, and a longer confirmation test is still needed.
- Obtaining **sputum** involves getting a sample of a patient's phlegm by having him or her cough it up. Sputum samples are usually ordered when a patient is exhibiting pneumonia-like symptoms that could be an indicator of an inhalational form of anthrax, plague, or tularemia. The sample is then stained and viewed under a microscope to look for the presence of certain bacteria. Part of the same sample is also used for a culture.

There are also more sophisticated tests that are used to identify agents, such as:

- **Immunoassays,** which look for specific antigens or antibodies and are useful in detecting the presence of toxins. However, antibody production for identification can take time.

- **Gene amplification assays,** such as a polymerase chain reaction, which look at the DNA or RNA to identify an agent. However, sample preparation can take a long time.

In general, detection and identification using any of these methods is dependent on the sample quantity and quality and the exactness of the processing. A combination of tests will yield the most accurate results. In the absence of immediate results, physicians who suspect bioterrorism may begin a preliminary course of treatment until the lab results are in.

HOW LONG TESTING SHOULD TAKE

Unfortunately, there is no single answer to the question of how long testing will take. The testing of biological agents is complicated by several factors, which can affect the time that passes before the presence of an agent can be confirmed or a diagnosis can be made. These factors include:

- **Identifying the agent:** Although bioterrorism is now a household term, actual incidents of bioterrorism have been rare, leaving today's physicians with limited experience in identifying these agents in the lab or treating affected patients. This means that the first patients who become sick may be mistaken for having other illnesses, thus causing a delay in the effort to test for biological agents.
- **Presumptive vs. confirmatory diagnoses:** Not all tests are conclusive. Some tests, such as Gram stains, can give a presumptive diagnosis that an agent is present, but followup tests are needed. In general, presumptive diagnosis of an agent can usually be made in about a day. Confirmatory diagnosis can take 2–3 days.
- **Viral, bacterial, or toxin load:** The "load" refers to how much of the agent is present in a patient. If relatively large amounts of an agent are present in a patient, cultures designed to grow the bacteria or virus could take as little as a few hours. If smaller amounts of the agent are present in a patient, these same culture tests could take up to 2 or 3 days.
- **Lab capabilities:** Can the needed tests be done in local labs, near a suspected attack, or do the samples need to be shipped out to more advanced labs, thus affecting the overall timeline? Shipping samples to more advanced labs can tack on an extra day or two to the wait time. CDC's Laboratory Response Network helps facilitate this process.
- **The kind of test that is used:** Numerous tests are employed to detect the presence of bioterror agents. Blood cultures can take up to 3 days, in some cases for example, but Gram stains can be ready within an hour. However, some of these quicker tests will only give preliminary information, which must be confirmed with more comprehensive tests.

More information on the laboratory system in the United States can be found in the "Planning for the Unthinkable: Preparation and Response in Public Health" section (see p. 5).

WHAT WE DON'T KNOW ABOUT BIOLOGICAL WEAPONS OF MASS DESTRUCTION

- It is not known who is in possession of biological Weapons of Mass Destruction.
- Medical experts do not know if bacteria have been engineered to be resistant to antibiotics.
- Experts do not know how potent the strains will be in a biological attack.
- Experts do not know if the illnesses caused by some of these agents will be immediately recognizable.
- There is disagreement on how long some of these agents can survive in the environment.
- Experts do not know if the diseases these agents cause will be the same as past epidemics (e.g., is today's smallpox the same as the disease that was eradicated?).

THERE IS NO SINGLE ANSWER to the question of how long testing will take.

CATEGORY A AGENTS

Category A agents are defined by CDC as the "highest priority" of concern for potential bioterrorist threats. Category A agents are given the most consideration in this section because there are many different kinds—each with a different effect on the body—and because the natural origin of these so-called bioweapons makes the building blocks relatively easy for terrorists to acquire. In general, dissemination of any of the Category A agents could strain the public health care system and cause widespread concern.

Basic facts and scientific information for Category A agents are provided; agents are treated alphabetically.

A

ANTHRAX

BASIC FACTS

- **Scientific name: *Bacillus anthracis;* rod-shaped bacteria (not a virus).**
- **Anthrax is the disease that develops after exposure to spores produced by this bacteria.**
- **The spores can remain dormant for long periods but are still capable of causing infection when someone comes in contact with them by touching or breathing them in.**
- **Anthrax spores can cause three types of illness, depending on how a person is exposed:**
  - **Inhalational (respiratory)—most lethal**
  - **Cutaneous (skin)**
  - **Gastrointestinal (digestive)**
- **The anthrax illness is not contagious.**
- **Anthrax can be treated with antibiotics if diagnosed early.**
- **An anthrax vaccine exists but is not in widespread use.**

ANTHRAX SPORES AS A WEAPON

Historically, many nations have weaponized anthrax by turning it into a concentrated powder or aerosol form. Generally, anthrax spores tend to clump together and the body can defend itself against them in that form. In a refined state, however, the spores are very dangerous when inhaled.

- Anthrax bacteria are easy to grow in a lab but not easy to refine as a weapon.
- Anthrax spores can be manipulated so they can float through the air and disperse as widely as possible.
- Anthrax spores can be released into the air directly or through a building's heating and ventilation system.
- The 2001 anthrax attacks demonstrated that spores can even be distributed through envelopes in the mail.
- Once aerosolized, anthrax spores cannot be seen by the naked eye or smelled.
- Weaponized anthrax spores can remain in the environment for long periods of time.

WHAT WE DON'T KNOW ABOUT ANTHRAX AS A WEAPON

- Exactly how long the spores remain dangerous is unclear.
- Experts cannot say whether spores can become airborne again after settling. This was one of the issues that made it difficult to assess how the attacks on the U.S. mail system would play out.
- Experts disagree on how many spores are necessary to infect someone. Originally it was believed that it would take up to 10,000; but after the 2001 attacks, experts have revised that number; some believe it takes only a few thousand. For immune compromised people, there is no safe lower limit.

IDENTIFYING AN ATTACK

- An anthrax attack will most likely go undetected until people start becoming sick.
- Tests to confirm the presence of anthrax spores can be conducted on suspicious powder or residue.
- Environmental testing confirms the presence of spores in a building.
  - Testing determines the extent of exposure in a building or site (whether anthrax spores are there and how many).
  - Initial tests onsite are not as accurate as subsequent lab tests and can sometimes generate false positive results.
  - Initial tests may miss smaller quantities of spores.
  - Samples must be sent to specialized laboratories for more definitive tests.
  - Receipt of conclusive results can take up to 72 hours due to the complexity of taking the sample (workers must wear protective suits), transporting it to a specialized lab, isolating the bacteria or spores, and producing a test result.
- Blood tests are more reliable in confirming individual cases of anthrax disease.
- Nasal swabs can be a quick tool to confirm the presence of anthrax spores in a given environment (but not to diagnose illness). See the following "Diagnosis" section for more information.

ANTHRAX ILLNESSES

Anthrax spores can induce three types of illness, depending on how they make contact with the human body.

INHALATIONAL ANTHRAX

Exposure

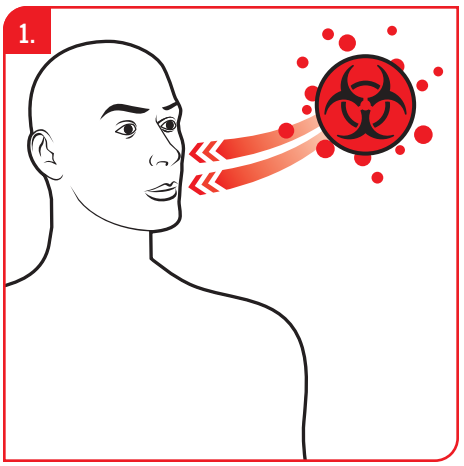
- Victims breathe in spores floating through the air; the spores then lodge in their lungs.
- Certain cells take the spores to the lymph nodes surrounding the lung. Once they enter the lymph nodes, the spores germinate into bacteria and cause inflammation and enlargement of these lymph nodes.
- Anthrax bacteria then spread from the lymph nodes to sites throughout the body and produce a toxin that can be destructive to organs and is difficult to treat.

Symptoms

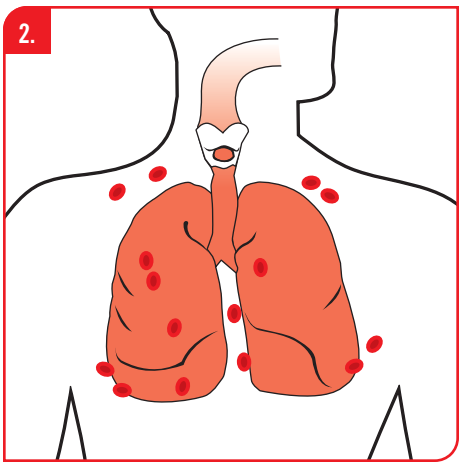
Symptoms can occur within 7 days of infection or can take up to 42 days to appear. These symptoms include:

- Fever (temperature greater than 100 degrees Fahrenheit); may be accompanied by chills or night sweats
- Flu-like symptoms
- Cough, usually a non-productive cough; chest discomfort; shortness of breath; fatigue; or muscle aches
- Sore throat, followed by difficulty swallowing; enlarged lymph nodes; headache; nausea; loss of appetite; abdominal distress; vomiting; or diarrhea

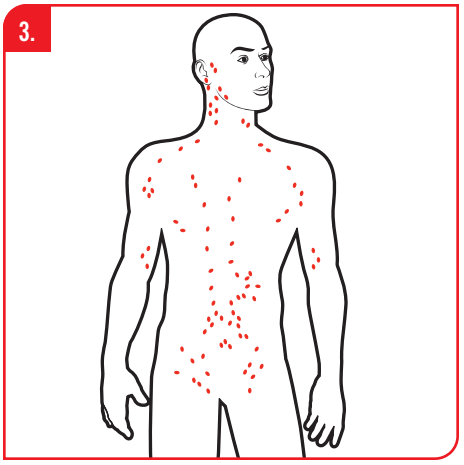
FIGURE 3–2: INHALATIONAL ANTHRAX



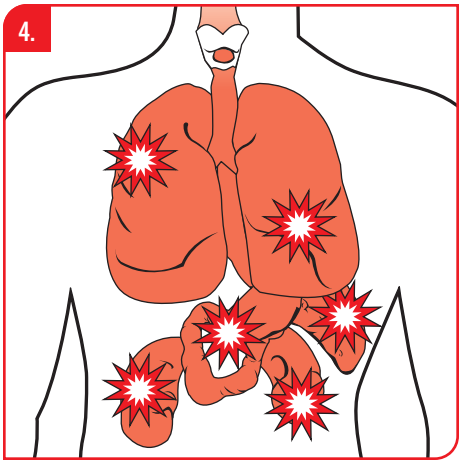
Anthrax spores inhaled.



Anthrax spores lodge in lungs where certain cells take them to lymph nodes surrounding the lungs. Once they enter the lymph nodes, the spores germinate into bacteria and cause inflammation and enlargement of these lymph nodes.



Anthrax bacteria spread from the lymph nodes around the lungs and throughout the body.



Anthrax bacteria produce toxin that can destroy organs.

Note: Antibiotics must be prescribed quickly to kill the anthrax bacteria.

Recovery/Mortality Rate

- Inhalational anthrax is the most lethal form of an anthrax illness.
- Inhalational anthrax was the cause of all five deaths in the 2001 U.S. postal system attacks.
- Some patients treated with antibiotics can have an initial recovery followed by a relapse once antibiotic therapy has been terminated.
- Inhalational anthrax, like most diseases, is more deadly for people with compromised immune systems.
- Untreated inhalational anthrax has a 90 percent mortality rate.
- The survival rate for inhalational anthrax victims depends on quick diagnosis and treatment with antibiotics.
- The mortality rate is still approximately 75 percent, even with antibiotics.

CUTANEOUS ANTHRAX

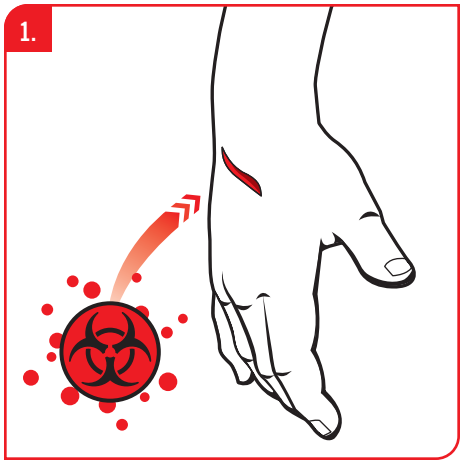
Exposure

Anthrax spores enter the body through an open wound or cut, or even through microscopic breakdowns of the skin.

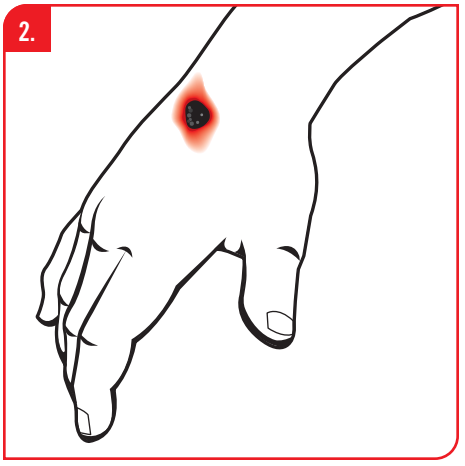
Symptoms

- Symptoms appear within 1–7 days after exposure.
- A small sore quickly develops into a blister.
- The blister becomes a skin ulcer, or eschar, and ultimately develops a black scab in the center.
- The sore, blister, and ulcer do not hurt and initially look like a spider bite.

FIGURE 3–3: CUTANEOUS ANTHRAX



Anthrax spores enter the body through an open wound or cut, or even through microscopic breakdowns of the skin.



Within 1–7 days, a small sore develops into a blister that becomes a skin ulcer and ultimately develops a black scab in the center.

Recovery/Mortality Rate

- Cutaneous anthrax is the least deadly form of anthrax.
- The survival rate is 80 percent without treatment and more than 99 percent with treatment.

GASTROINTESTINAL ANTHRAX

Exposure

Gastrointestinal anthrax occurs when anthrax is ingested, usually through meat from anthrax-infected animals.

Symptoms

- First signs of the infection appear within 2–5 days of exposure.
- Initial symptoms include nausea and loss of appetite.
- Later symptoms include bloody diarrhea, fever, and severe stomach pain.
- Symptoms mirror those for stomach flu, food poisoning, and appendicitis.

Recovery/Mortality Rate

If untreated, at least 25 percent of gastrointestinal anthrax cases lead to death.

DIAGNOSIS

To treat someone with an anthrax illness successfully, it must be diagnosed early. Early diagnosis is complicated because there is no single screening test to confirm anthrax illness.

- Exposure is confirmed by isolating the anthrax bacteria from the blood, skin lesions, or respiratory secretions or by measuring specific antibodies in the blood.
- Blood tests to confirm an anthrax infection can take up to 72 hours, since it takes time to isolate a particular bacterium in a blood sample. Some circumstances may produce test results much more quickly. For example, in a severe inhalational case, there may be

a large concentration of bacteria in a sample, which may allow technicians to obtain a result in a few hours.

- If inhalational anthrax is suspected, physicians typically obtain a chest X-ray and a CAT scan to confirm their suspicions.
- Nasal swabs can detect the presence of spores but are not a diagnostic tool. A positive swab does not mean a person will develop an anthrax illness and a negative swab does not mean a person will not develop an anthrax illness. A nasal swab is only an indicator of whether anthrax spores are present in an area.

WHAT WE DON'T KNOW ABOUT ANTHRAX AS AN ILLNESS

- No one knows for sure when treatment must begin to be successful. Some believe antibiotics must start within hours, others say days.
- Physicians do not know if children or specific ethnic groups are more vulnerable to anthrax than the general population.
- There is still debate about how many spores are needed to infect a person.

TREATMENT

All three types of anthrax can be treated with antibiotics. Though ciprofloxacin was first used as a treatment for anthrax during 2001, doxycycline is now the preferred antibiotic for anthrax infection. The reason for this is to prevent other bacteria from developing resistance to ciprofloxacin.

- Antibiotics are prescribed for 60 days.
- Treatment must begin as soon as possible after exposure to be successful because the bacteria produce a toxin in the body that poisons the system quickly and sometimes irreversibly. Antibiotics kill the bacteria but cannot remove the toxin or lessen the effects of any toxin already in the body. There is no antitoxin for the anthrax toxin.
- Those with inhalational anthrax normally have to be hospitalized and on a ventilator to help with breathing.
- Anthrax patients do not have to be isolated since the illness cannot be passed from person to person.
- Which antibiotic is prescribed depends on a patient's age and health, the number of cases in the area being treated, and what is available at the hospital and/or through the Strategic National Stockpile. More information on the Strategic National Stockpile can be found in the "Planning for the Unthinkable: Preparation and Response in Public Health" section (see p 5).
- Additional antibiotics for treatment of anthrax are being studied in animal efficacy trials.

VACCINE

- The vaccine is used as a preventive measure for those in high-risk populations, including:
  - Lab workers
  - Members of the armed forces deployed to countries suspected of having biological weapons programs
- The current anthrax vaccine is not available to the general public but might be used if an anthrax attack occurs.
- The vaccine is given as a series—three shots administered 2 weeks apart.
- Subsequent injections are given at 6, 12, and 18 months; annual boosters follow.
- The current vaccine can have side effects:
  - *Mild side effects* may include soreness, itching, or a lump where the shot was administered; muscle or joint aches; fatigue; or headache
  - *Severe side effects* may include a severe allergic reaction (very rare)
  - There is no evidence that the vaccine has long-term adverse side effects
- In October 2004, HHS awarded a contract to VaxGen, Inc., for the manufacture of 75 million doses of a new anthrax vaccine for the Strategic National Stockpile. Evidence from laboratory and animal research has shown that the new vaccine, which uses purified recombinant protective antigen, is effective in providing protection against aerosol exposure to anthrax spores (HHS 2004).
- For more information on the clinical trials for new anthrax vaccines, anthrax diagnostic tests, and new antibiotics for anthrax treatment, see NIAID's Web site (http://www2.niaid.nih.gov/biodefense).

PREVENTION

Although anthrax cannot be spread from person to person, the spores can travel widely. Following are steps that can be taken to minimize the risk to people who have come into contact with anthrax spores:

- Wash skin with soap and water
- Start antibiotic treatment if exposure is suspected but not yet confirmed
- Treat mail with low doses of radiation; irradiating mail kills anthrax spores
- Use special mail handling procedures, such as wearing gloves and masks, to prevent cutaneous anthrax

ANTHRAX HISTORICAL TIMELINE

Naturally occurring, anthrax has affected humans for centuries. It was typically contracted by people, as well as animals, who ate, handled, or inhaled spores from infected animals or animal products. Early cases of reported anthrax exposure, however, were isolated and were among workers who handled wool or leather products.

1876: Robert Koch isolates the bacteria that cause anthrax.

1880: First successful immunization against anthrax is performed on livestock.

1937: Japan starts biological warfare program in Manchuria, including tests involving anthrax.

1942: The United Kingdom experiments with anthrax at Gruinard Island off the coast of Scotland (which was only recently decontaminated).

1943: The United States begins developing anthrax weapons.

1970: Anthrax vaccine is approved by the U.S. Food and Drug Administration.

1972: At the Biological Weapons Convention, more than 100 nations agree not to produce or stockpile Weapons of Mass Destruction (including the United States).

1979: Aerosolized anthrax spores are released accidentally at a Soviet Union military facility, killing about 68 people.

1991: U.S. troops are vaccinated for anthrax in preparation for the Gulf War.

1995: Iraq admits it produced 8,500 liters of concentrated anthrax as part of its biological weapons program.

1998: U.S. Secretary of Defense William Cohen approves an anthrax vaccination plan for all military service members.

2001: Letters containing anthrax powder are sent through the U.S. Postal Service; 22 people become ill and 5 people die.

ASSESSING THE RISK

- Because it is a naturally occurring bacteria and is studied in thousands of labs, anthrax is **readily available.**
- Anthrax spores are **highly stable** and can survive in the environment for decades.
- Terrorists would have to be **highly skilled** to mill weapons-grade anthrax spores or distribute them effectively to inflict mass casualties.
- Anthrax is **highly lethal** and may potentially be made more so by engineering it to be resistant to antibiotics.

THE CHALLENGE OF ACCEPTING AND COMMUNICATING UNCERTAINTY: IMPLICATIONS OF THE ANTHRAX ATTACKS

As with many of the naturally-occurring diseases that could be caused by acts of terrorism, anthrax is a disease that is rare in America today. Between 1989 and the anthrax attacks of 2001, only one case of anthrax was reported in the United States. Earlier in the 20th century, there were only 100 cases per year, and it is thought that the anthrax illness had been largely prevented through an animal vaccination program.

Much of what was known about anthrax before the 2001 attacks was based on these historical case records. CDC conducted 41 field investigations from 1950 to 2001, which supplied information about how anthrax can be contracted, how it affects the body, and the kinds of decontamination procedures used. Most of these cases involved agricultural workers who handled infected animals. The public health community approached the 2001 attacks with this real-world, working knowledge of anthrax. Unfortunately, the weaponized anthrax used in 2001 showed that what was true of naturally occurring anthrax did not prove true for this new, weaponized form of the pathogen.

For example, the miniscule size of the weaponized anthrax spores released in 2001 showed that the spore powder could actually escape through the tiny pores in paper envelopes and infect people who handle the envelopes—something naturally occurring spores could never do.

Officials are learning that what we "think we know" about these pathogens may not hold true during a bioterror attack. And these differences can change the way an illness is contracted, prevented, treated, and decontaminated. Communication with the public will try to explain that the ongoing investigation during the actual incident may reveal characteristics of the pathogens that are new and unexpected. Public health treatment and containment strategies will be based on the best available knowledge at the time and may need to be adapted during the crisis as new facts are brought to light. Former CDC Director Jeffrey Koplan said it well in 2001: "No doubt there will be things we learn 2 weeks from now that we wish we would have known today."

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BOTULINUM TOXIN

BASIC FACTS

- **Scientific name: Botulinum toxin. The toxin, or poison, is produced by the bacterium *Clostridium botulinum* (not a virus).**
- **Botulinum toxin is the most poisonous substance known to science.**
- **Botulism is a muscle-paralyzing disease that develops after a person is poisoned with botulinum toxin.**
- **The toxin is colorless, odorless, and tasteless.**
- ***Clostridium botulinum* exists naturally in the environment, and the botulinum toxin it produces can cause two types of illness:**
  - **Foodborne botulism**
    - **Infant botulism**
  - **Wound botulism**
- **Inhalation botulism, caused by breathing botulinum toxin, does not occur naturally but could happen as a result of deliberate dissemination of the toxin in the air by a technologically sophisticated terrorist or as a laboratory accident.**
- **Botulism is not contagious.**

BOTULINUM TOXIN AS A WEAPON

Clostridium botulinum bacteria produce a toxin. Terrorists have tried to weaponize botulinum toxin by refining the toxin and putting it into an aerosol form. Refined or crude preparations of toxin could be used to poison food or beverages, and refined toxin, with a sophisticated delivery system, could be used to disseminate the toxin by air.

- Botulism toxin can be disseminated via the air, water, or food.
- Such contamination would be hard to detect because botulinum toxin is colorless, odorless, and tasteless.
- Poisoning the water supply would be difficult for terrorists because:
  - Large quantities of toxin would be needed to affect the water system
  - Chlorine in most water treatment facilities would destroy the toxin

WHAT WE DON'T KNOW ABOUT BOTULINUM TOXIN AS A WEAPON

Experts believe that only a small amount of the toxin would need to be inhaled to be deadly on a large-scale basis. However, because there has never been a successful attack, the exact amount needed is still a question.

IDENTIFYING AN ATTACK

- Because botulinum toxin is colorless, odorless, and tasteless, a foodborne, waterborne, or aerosol attack would probably go unnoticed until people exhibit symptoms.
- Existing public health surveillance is likely to rapidly identify a large-scale attack once victims began seeking medical care.

BOTULINUM TOXIN ILLNESSES

FOODBORNE BOTULISM

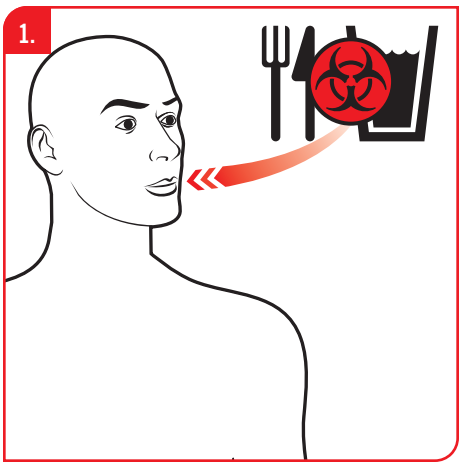
Exposure

- This form of botulism is caused by eating improperly preserved or cooked food; contamination can be caused by improper canning or cooking of foods.
- Contaminated food may be discolored or have a bad odor or taste.
- In infants, botulism can occur when a large amount of the spore is ingested through food products, such as honey and corn syrup, normally tolerated by adults.

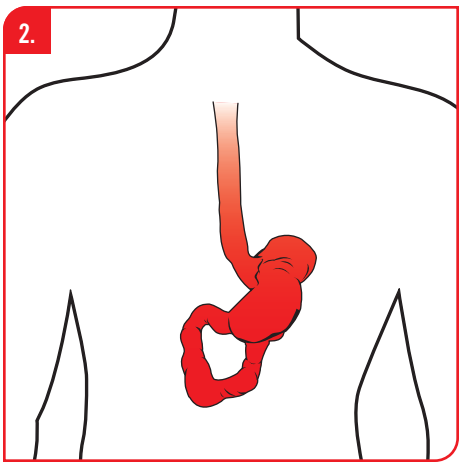
Symptoms

- Foodborne symptoms generally begin 18–36 hours after eating contaminated food but can occur as early as 6 hours or as late as 10 days after food consumption.
- Initial symptoms include blurred or double vision, slurred speech, drooping eyelids, difficulty swallowing, dry mouth, and muscle weakness.
- Botulism toxin spreads throughout the body and predominantly affects the nervous system.
- Within hours, a facial paralysis begins and spreads to the rest of the body.
- Botulism can result in respiratory failure.

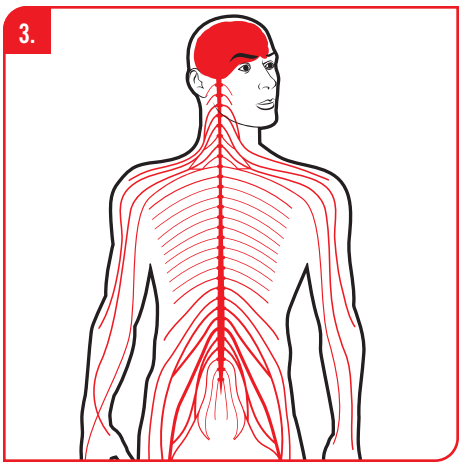
FIGURE 3–4: FOODBORNE BOTULISM



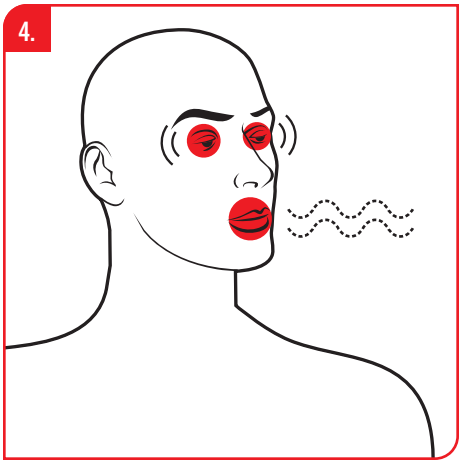
Botulinum toxin ingested through food or water.



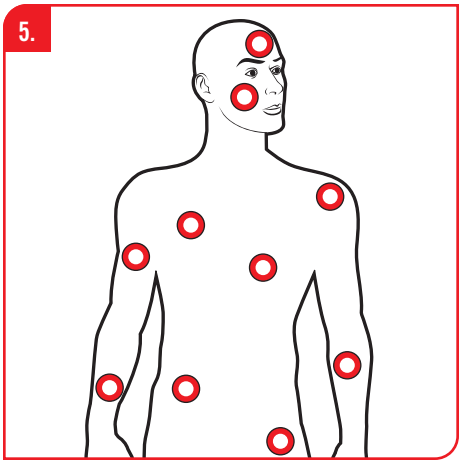
Botulinum toxin absorbed.



Botulinum toxin spreads throughout the body and predominantly affects the nervous system.



Initial symptoms include blurred or double vision, drooping eyelids, and slurred speech.



Within hours, a facial paralysis begins and spreads through the body.

Note: Symptoms of inhalational botulism would be similar.

Recovery/Mortality Rate

If treated, ingested botulism has a survival rate of more than 90 percent.

WOUND BOTULISM

Exposure

- This form of botulism is extremely rare.
- It occurs when someone gets the bacteria into an open cut.
- This illness is most often found in injection drug users.

Symptoms

Symptoms are similar to those for foodborne or inhaled botulism.

Recovery/Mortality Rate

The fatality rate for wound botulism is less than 3 percent.

INHALATIONAL BOTULISM

Exposure

- This form does not occur naturally and only three cases (from a laboratory accident) have ever been reported.
- It would be caused if people inhaled refined botulinum toxin disseminated through the air.

Symptoms

- Symptoms of inhaled botulinum toxin are similar to those of foodborne botulism.
- Symptoms may begin several hours to several days after an airborne attack (e.g., studies with monkeys show that symptoms begin 12–80 hours after exposure).

Recovery/Mortality Rate

Because there are so few recorded cases, it is unclear what the fatality rate of inhalation botulism would be in an attack.

DIAGNOSIS

Botulism is a rare disease. Whether it is naturally occurring or the result of terrorism, a single case of the illness may be difficult for physicians to diagnose. However, if several or many cases appear together, it is likely that the diagnosis would be made quickly.

- There is no single test to detect botulinum poisoning.
- A blood test can detect traces of botulinum.
- A stool sample test may be useful in detecting foodborne or infant botulism.
- Suspected foods should also be tested for presence of the botulinum toxin.
- Special tests (e.g., brain scan) may be needed to exclude similar conditions from botulism.

TREATMENT

Prompt medical attention is the key to successful treatment for a botulism illness.

- Treatment should begin as soon as botulism is suspected.
- Botulism antitoxin derived from horse serum is prescribed.
- This antitoxin reduces the spread of paralysis but will not reverse paralysis that has already set in, so early treatment is critical.
- With treatment, most paralysis will eventually go away.
- In severe cases, patients may need long-term care, including a ventilator to help assist breathing.

VACCINE

A vaccine to protect against botulism is not available to the general public.

- An experimental vaccine produced in the 1960s is given to lab workers and military troops sent to high-risk areas.
- This experimental vaccine is not considered useful for the general population because many months pass before a vaccinated person builds full immunity and because repeated vaccination is required to maintain this immunity.
- People who receive the experimental vaccine may not benefit from the medical uses of botulinum toxin, including cosmetic surgery and treatment of vocal chord spasms.

PREVENTION

Proper food handling and cooking is the best way to prevent naturally occurring botulism poisoning.

- Do not eat food that has been left out for long periods of time.
- Practice proper home canning of food to reduce the risk of botulism.
- Boiling food for 10 minutes can destroy botulinum toxin if there is concern that food has been contaminated.

BOTULINUM TOXIN HISTORICAL TIMELINE

World War II: Japan uses botulinum toxin to poison food of Chinese prisoners.

Cold War Era: Various nations, including the Soviet Union and the United States, experiment with botulinum toxin as a bioweapon.

1972: At the Biological Weapons Convention, more than 100 nations agree not to produce or stockpile Weapons of Mass Destruction (including the United States).

1990: Japanese cult Aum Shinrikyo tries unsuccessfully to produce an aerosol version of botulinum toxin.

Post-Cold War: Some nations in the Middle East are suspected of having stockpiles of botulinum toxin; some former Soviet Union stockpiles of botulinum toxin are unaccounted for.

ASSESSING THE RISK

- *Clostridium botulinum* is a common, naturally occurring bacteria, but the toxin is not **easily available** because one has to have the laboratory knowledge to produce the toxin from the bacteria.
- Botulinum toxin is only **moderately stable** because the aerosol form can deteriorate in sunlight.
- Terrorists would have to be **highly skilled** to stabilize the botulinum toxin for airborne release. A foodborne release would be somewhat easier.
- An airborne attack could produce **highly lethal** results; a foodborne attack could also be lethal.

PLAGUE

BASIC FACTS

- **Scientific name: *Yersinia pestis*; a bacterium (not a virus).**
- **Plague is the disease that develops after infection with this bacterium.**
- **Humans contract plague by inhaling it or from the bite of an infected flea.**
- **Plague infection takes three primary forms:**
  - **Bubonic**
  - **Pneumonic**
  - **Septicemic**
- **Only pneumonic plague is contagious through respiratory droplets with direct close contact (within 6 feet).**
- **Plague is highly lethal if untreated.**
- **Plague can be treated with antibiotics if caught early.**
- **Some plague infections occur naturally each year (usually bubonic).**

PLAGUE AS A WEAPON

Because pneumonic plague is highly lethal and contagious and would quickly overwhelm communities and their health care systems, countries with biological weapons programs have explored using plague in aerosol form to infect large groups of people.

- A pneumonic plague outbreak would be difficult to contain.
- Treatment must be immediate (within 24 hours of first symptoms) to be successful.
- Once refined, plague bacteria can be released into the air undetected.
- Once released into the air, plague bacteria remain infectious for up to an hour.
- Aerosolized plague bacteria can infect large groups of people quickly.
- Plague bacteria degrade quickly in sunlight or heat.

WHAT WE DON'T KNOW ABOUT PLAGUE AS A WEAPON

Experts are uncertain as to how wide an area would be affected by an aerosol release of plague bacteria or whether it can be disseminated successfully through the mail, as was the case with anthrax.

IDENTIFYING AN ATTACK

- A plague attack will likely go unnoticed until people exhibit symptoms.
- Tests of powder or residue can identify the presence of plague bacteria.

PLAGUE ILLNESSES

There are three common forms of illness caused by the plague bacteria:

BUBONIC

Exposure

- Bubonic plague is caused when infected fleas bite humans.
- A person can also be infected through a break in the skin.
- This form of plague illness is not contagious.

Symptoms

- Bubonic plague infects the lymphatic system and causes severe swelling.
- The first symptoms appear 2–6 days after infection and include weakness, high fever, and chills.
- If bubonic plague is not treated, bacteria can spread through the bloodstream, causing septicemic plague or a secondary case of pneumonic plague.
- Later symptoms appear, such as muscular pain, swelling of lymph glands, and seizures.

Recovery/Mortality Rate

If untreated, bubonic plague is fatal in more than 50 percent of cases because of progression of the bacteria into the bloodstream.

PNEUMONIC

Exposure

- This form of the disease infects the lungs.
- It is caused by breathing in aerosolized plague.
- This illness can be transmitted from person to person through respiratory droplets with direct close contact (within 6 feet).

Symptoms

- Symptoms usually surface 2–4 days (range of 1–6 days) after exposure.
- Initial symptoms include high fever, cough, and chills, similar to the flu.
- Later symptoms include pneumonia and bloody sputum (coughing up blood).

Recovery/Mortality Rate

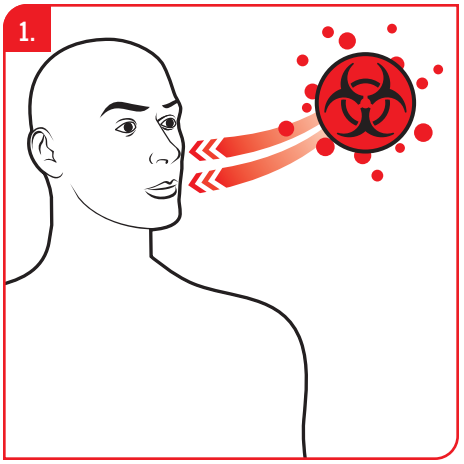
- Without early detection and treatment, the mortality rate from pneumonic plague is nearly 100 percent.
- If treated, the mortality rate from pneumonic plague is still 50 percent.

SEPTICEMIC

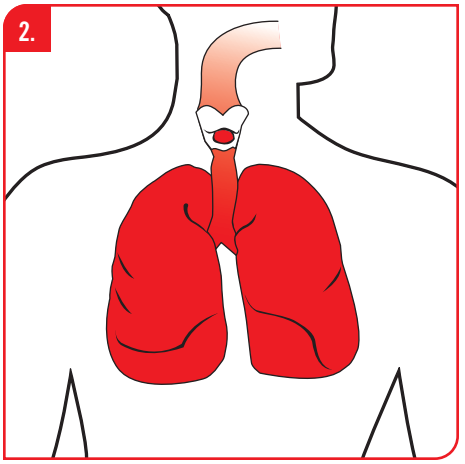
Exposure

- Septicemic plague may be a secondary illness caused by complications from bubonic or pneumonic plague, or it can occur by itself.
- Plague bacteria enter the bloodstream.
- This form of the disease is not contagious.

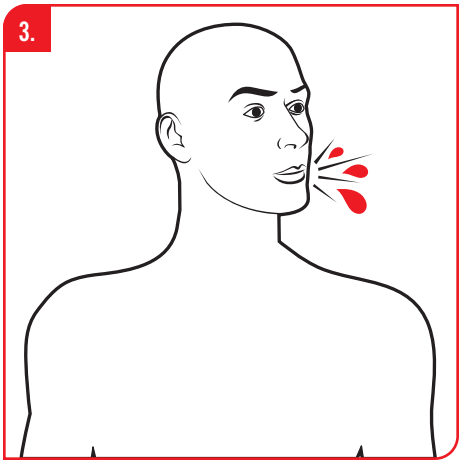
FIGURE 3–5: PNEUMONIC PLAGUE



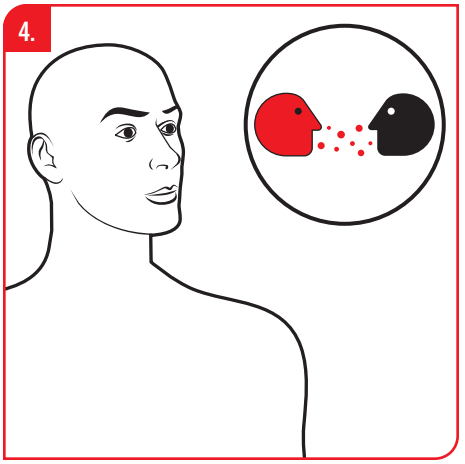
Plague bacteria inhaled.



Pneumonia starts to develop within 1–6 days.



Symptoms include coughing up blood.



Plague may be transmitted to others through respiratory droplets (contagious).

Symptoms

- Symptoms appear 2–6 days after infection.
- Initial symptoms include nausea, vomiting, fever, and chills.
- Later symptoms include low blood pressure, abdominal pain, shock, and, finally, internal bleeding.

Recovery/Mortality Rate

- Death occurs rapidly if this form of plague is untreated.
- Even with treatment, the recovery rate is only 50 percent.

DIAGNOSIS

Plague can be difficult to diagnose because its initial symptoms are flu-like and the disease progresses so rapidly. Because it is contagious in the inhaled form, a bioterror attack involving plague could go undetected until large groups of people begin exhibiting symptoms.

- If bubonic plague is suspected, physicians check for the presence of a painful, swollen lymph node called a bubo, which occurs no more than 24 hours after initial symptoms.
- Blood cultures, a sputum sample, or examination of a lymph node sample can confirm plague.
- Physicians will ask for a travel history from the patient to see if he or she has traveled to a known outbreak area.

TREATMENT

Treatment of plague with antibiotics must begin immediately to be effective. Containing a plague outbreak involves isolation and other precautions so that plague does not quickly spread in communities and overwhelm the health care systems.

- Antibiotics, such as streptomycin, gentamicin, the tetracyclines, and chloramphenicol, are all effective against plague.
- Determining which antibiotic to prescribe depends on patient age, health, and availability of the drug, in addition to the number of cases in an area.
- Antibiotic treatment for pneumonic plague must begin within 24 hours after the first symptoms to be successful.
- Patients with pneumonic plague should be isolated.
- Antibiotics are recommended for people exposed to someone who has pneumonic plague.
- As a precaution, antibiotics may be administered to a person before plague is diagnosed.

VACCINE

- There is currently no licensed plague vaccine available in the United States.
- Clinical trials on a vaccine for pneumonic plague are underway. For more information, see NIAID's Web site (http://www2.niaid.nih.gov/biodefense).

PREVENTION

- Preventing plague starts with controlling flea and rat populations, the two known carriers of plague.
- Insect repellants should be used to prevent flea bites.
- People traveling to an outbreak area may be given a 3-week course of preventive antibiotics.

PLAGUE HISTORICAL TIMELINE

Middle Ages: Plague, sometimes called the "Black Death," kills millions in Europe; invading armies use plague corpses as weapons.

World War II: Japanese army drops plague-infected fleas over China; it is unclear how many people were infected.

Cold War: The United States and the Soviet Union study plague as a biological weapon; the Soviet Union learns ways to aerosolize plague.

1970: The United States suspends its program.

1972: At the Biological Weapons Convention, more than 100 nations agree not to produce or stockpile Weapons of Mass Destruction (including the United States).

Post-Cold War: Stockpiles of plague are unaccounted for in the former Soviet Union; laboratories around the world receive plague samples for study.

ASSESSING THE RISK

- Although plague bacteria are under study in many countries, safeguards in these labs would make a potent strain **minimally available** to terrorists.
- Plague is **moderately stable** in the environment. It can remain infectious for up to an hour after being released into the air, but the organism will break down more quickly if exposed to sunlight or heat.
- Terrorists would have to be **highly skilled** to refine plague into an aerosol attack.
- Plague is **highly lethal** even with treatment.

SMALLPOX

BASIC FACTS

- **Scientific name: Variola Major; a virus from the Orthopoxvirus family.**
  - **A closely related virus, Variola Minor, causes a less severe form of illness with less than 1 percent fatality rate.**
- **Smallpox was a naturally occurring disease that killed an estimated 300 million people in the 20th century.**
- **Officially eradicated in nature in 1980, smallpox has more recently been of concern as a potential bioterrorism threat.**
- **The smallpox virus is moderately contagious; direct, face-to-face contact is usually required to spread the disease. Smallpox can also be spread through direct contact with infected body fluids or contaminated objects (e.g., bedding).**
- **Characterized by skin lesions and high fever, smallpox historically has killed approximately 30 percent of those infected.**
- **Routine vaccinations in the United States ended in 1972. At present, a large portion of the population is considered vulnerable to infection should a bioterrorism incident occur.**

SMALLPOX AS A WEAPON

Because it is contagious from person to person and could potentially infect large groups of people, taxing the health care systems of a community, smallpox would be an attractive weapon for terrorists. It would most likely be delivered in an aerosol form.

- The smallpox virus could be disseminated into the air as a fine spray or powder and could infect large numbers of people.
- In aerosol form, the smallpox virus may be infectious for 24 hours before degrading. Heat and sunlight (UV exposure) may destroy the virus within hours.
- Terrorists could possibly use smallpox virus samples to intentionally infect a few people, possibly themselves, with the intention of infecting others. However, it is doubtful that any one individual would succeed in infecting more than a few others. By the time that these individuals were contagious, they would be very obviously seriously ill.

WHAT WE DON'T KNOW ABOUT SMALLPOX AS A WEAPON

Experts do not know if the smallpox virus in a weaponized form would be as contagious as the disease was before it was eradicated.

IDENTIFYING AN ATTACK

Because smallpox has been eradicated worldwide, even one case of smallpox would be considered a probable terrorist attack.

- The first sign of an attack would likely be victims becoming ill, usually between 7 to 17 days after exposure.
- A properly disseminated aerosol cloud of the smallpox virus would be invisible, odorless, and extremely hard to detect.

SMALLPOX ILLNESS

EXPOSURE

- The incubation period is typically 7–17 days following exposure.
- Infection usually occurs only when a susceptible person is in face-to-face contact with someone who has the virus and is ill with fever and a rash of round lesions.
- The virus is usually spread by droplets; however, having it spread by aerosol or contaminated objects (e.g., bedding) is also possible.
- Smallpox is not known to be transmitted by insects or animals.

SYMPTOMS

- Initial symptoms of smallpox may include high fever, fatigue, headache, and backache.
- Typically, people with smallpox are not contagious until lesions start appearing and they are obviously ill.
- **Two to 3 days after the onset of symptoms:** A rash of round lesions develops on the face, arms, and legs. At the same time, lesions in the mouth are also present and release large amounts of the virus into the saliva.

- **Seven days after the onset of symptoms:** The lesions become small blisters and by the seventh day are filled with pus.
- **Twelve days after the onset of symptoms:** Lesions begin to crust over. Severe abdominal pain and delirium can occur in the later stages of the disease.
- **Three to 4 weeks after the onset of symptoms:** Scabs develop and fall off. A patient who survives is no longer contagious after the final scab falls off.

RECOVERY/MORTALITY RATE

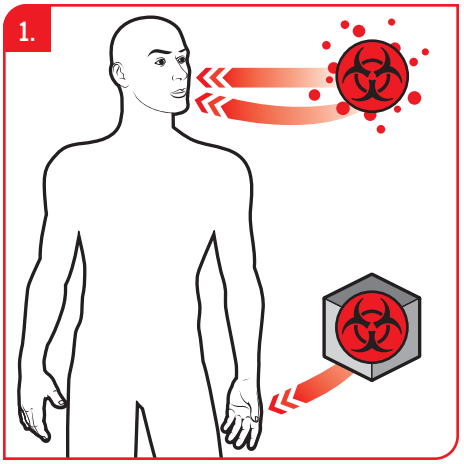
- Death is likely in one-third of all smallpox cases, usually during the first or second week of illness.
- Of those who recover, 65–85 percent are marked with deep-pitted scars.
- Some who recover may be permanently blind.

DIAGNOSIS

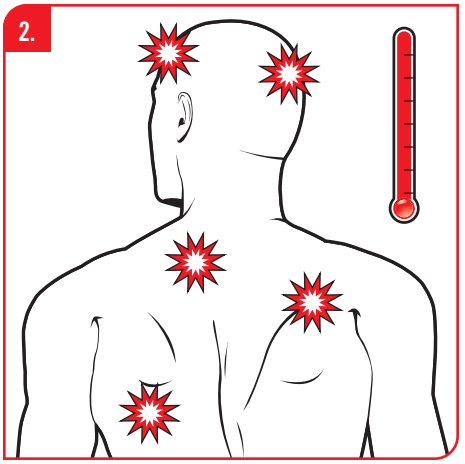
Physicians have not seen cases of smallpox for more than 2 decades, and making a diagnosis would require familiarity with the disease and its history. However, CDC has worked on educating first responders and emergency room personnel about the signs and symptoms of smallpox.

- Smallpox is most commonly identified by the distinctive rash it causes.
- The rash can sometimes be confused initially with chicken pox.
- The smallpox lesions are painful (as opposed to chicken pox lesions).
- The distribution of smallpox lesions on the body is different than chicken pox.

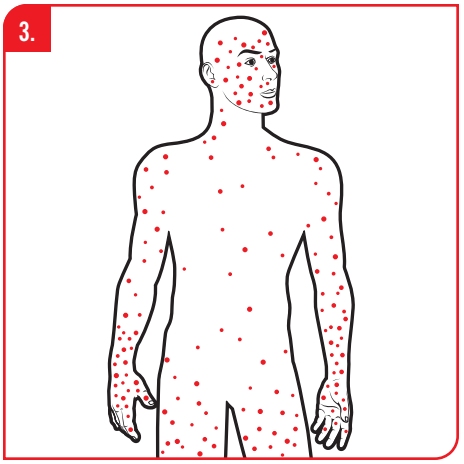
FIGURE 3–6: SMALLPOX



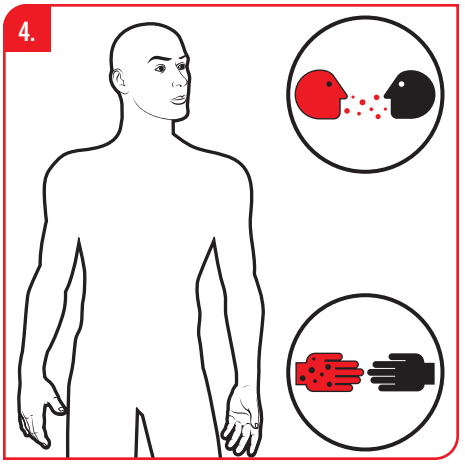
Smallpox virus inhaled or transmitted through contaminated objects.



Initial symptoms include headache, backache, and fever.



Severe rash starts on face, arms and legs, and spreads across the body.



Smallpox may be transmitted to others through bodily fluids (contagious).

- Patients with smallpox are typically much sicker.
- Testing of the fluid from the lesions can confirm smallpox.

TREATMENT

There is little that physicians can do, other than supportive care, to treat the illness itself; containing a smallpox outbreak becomes the priority once a case is suspected or confirmed. The public health community becomes involved to track down and vaccinate those who may have been exposed to an infected patient and their close contacts (e.g., family). Strict home or hospital isolation of cases is very important; close contacts must be kept under close daily surveillance and isolated if they develop fever.

- Antibiotics are not effective.
- There is no way to fight the virus once patients become sick.
- Patients with smallpox are isolated.
- Patients with smallpox may require intravenous (IV) fluids and medication to control fever or pain.
- Secondary bacterial infections of the skin sometimes occur. These can be treated with antibiotics.
- Research is currently underway on the use of the antiviral drug cidofovir as a treatment for smallpox.

VACCINE

After the September 11 attacks, fears that terrorists would use the smallpox virus as a biological weapon led to renewed vaccine production. There is now enough vaccine available in the Strategic National Stockpile for every American in case of an attack.

- The vaccine contains a live virus (vaccinia) which is related to the smallpox virus but entirely different from it; the vaccinia virus is weaker so that people produce antibodies but usually develop only the single pustule at the site of vaccination and, sometimes, a low grade fever.
- The vaccine provides a high level of immunity from infection for 3–5 years after vaccination and decreasing immunity thereafter. It is unclear how long the vaccine provides some protection against the disease. If a person is vaccinated again later, immunity lasts even longer.
- However, if a person actually has had smallpox and survives, he or she then has lifelong immunity.
- The vaccine prevents disease in 95 percent of those vaccinated.
- Given within 3 days after exposure to the smallpox virus, the vaccine will prevent or significantly modify smallpox in the majority of persons. Vaccination 4–7 days after exposure likely offers some protection from disease or may modify the severity of the disease.
- The smallpox vaccine is currently not administered to the general public because:
  - The likelihood of an attack is not known
  - Vaccination can result in complications for several well-defined, but specific, groups of people with skin conditions, such as eczema, as well as for people with HIV/AIDS and others with compromised immune systems
  - Pregnant women, infants under 1 year old, and those taking steroids could also suffer complications
  - Recent research indicates that people with certain heart conditions should not receive the vaccine (at least until further research is conducted)
- The vaccine is effective after one dose, so it could easily be given to many people if a smallpox event or outbreak takes place.
- Vaccination of only those people who might have been exposed to the smallpox virus and their contacts (ring vaccination) was used successfully in the past to eradicate smallpox. However, mass vaccination might be necessary in the aftermath of a terrorist attack. More information on vaccination strategies can be found in the "Planning for the Unthinkable: Preparation and Response in Public Health" section (see p. 5).

WHAT WE DON'T KNOW ABOUT THE SMALLPOX VACCINE

Experts do not know how many of those vaccinated or revaccinated for smallpox before 1972 can still get sick if exposed today.

PREVENTION

- Place smallpox patients in medical isolation so that they will not spread the virus.
- Take special precautions to ensure that all bedding and clothing of patients are cleaned using bleach and hot water.
- Clean contaminated surfaces with disinfectants, such as bleach or ammonia.
- Within 3 days, vaccinate people who have come into direct and prolonged face-to-face contact with smallpox patients. Closely watch them for symptoms of smallpox.
- In an aerosol release, widespread decontamination is not necessary, since the airborne virus rapidly blows away from the area and particles die on their own within 1–2 days.
- Physicians typically use a "ring vaccination" approach, vaccinating the circle of people who may have come in contact with a smallpox patient and the family contacts of this group of people in order to provide a ring of protection from further spread. This approach was successfully used in the past to control outbreaks until smallpox was finally eradicated.

SMALLPOX HISTORICAL TIMELINE

1700s: Smallpox is likely used as a biological weapon during the French and Indian War when British soldiers distributed blankets that had been used by smallpox patients to initiate outbreaks among American Indians.

1796: Edward Jenner uses the milder cowpox virus to develop a vaccine for smallpox.

1949: The last confirmed case of smallpox in the United States occurs.

1972:

- Routine smallpox vaccination ends in the United States.
- At the Biological Weapons Convention, more than 100 nations agree not to produce or stockpile Weapons of Mass Destruction (including the United States).

October 1977: An unvaccinated person in Somalia becomes the last documented naturally occurring case of smallpox in the world.

1980: The World Health Organization officially declares smallpox eradicated.

1989: Vaccination of U.S. military personnel is discontinued.

2002: Amid new fears of smallpox being used as a weapon, the Bush Administration announces a priority program to produce enough smallpox vaccine to assure its availability for every American. A voluntary program to vaccinate high risk health care workers is announced. More than 600,000 military personnel are vaccinated.

2003: Clinical trials are under way for a new vaccine; for more information, see NIAID's Web site (http://www2.niaid.nih.gov/biodefense).

ASSESSING THE RISK

- The smallpox virus has a **low availability,** as the only two confirmed repositories for the virus are in high containment laboratories in the United States and Russia. Still, there is concern that some countries may have secretly retained their smallpox samples for bioweapons research and production.
- The smallpox virus is **highly stable** (can survive for 1–2 days) in aerosol form.
- Terrorists would have to be **moderately skilled** to produce the smallpox virus in aerosol form if they could acquire the virus.
- Smallpox is **highly lethal** because it kills approximately 30 percent of those infected; it is quite contagious and spreads from person to person.

TULAREMIA

BASIC FACTS

- **Scientific name: *Francisella tularensis*; a bacterium (not a virus).**
- **Tularemia is the disease caused by this bacterium; it is also known as Rabbit Fever or Deer Fly Fever.**
- **Tularemia spreads to humans from infected animal tissue.**
- **The disease can be spread through contaminated food and water.**
- **Tularemia is not contagious.**
- **A small amount of the bacteria can cause the disease.**
- **There are three types of tularemia:**
  - **Ulceroglandular**
  - **Inhalational**
  - **Typhoidal**

TULAREMIA AS A WEAPON

Weaponized tularemia bacteria would most likely be disseminated through the air. But terrorists could also use the bacteria to contaminate food or water.

- If released into the air, *F. tularensis* can remain potent for up to 2 hours.
- The bacteria can survive at low temperatures in water, soil, hay, or frozen animal carcasses.
- The bacteria quickly degrade in heat once released in the air.

WHAT WE DON'T KNOW ABOUT TULAREMIA AS A WEAPON

Experts are not sure exactly how small an amount of bacteria is needed to cause infection. According to CDC, as few as 10–50 bacteria could cause disease.

IDENTIFYING AN ATTACK

- An attack may go undetected until people start getting sick.
- Testing of powder or residue can confirm the presence of tularemia bacteria.
- Environmental monitoring of air and water samples can detect the presence of tularemia bacteria.

TULAREMIA ILLNESSES

The tularemia infection takes several forms, depending on the strength of the bacteria and how they enter the body.

ULCEROGLANDULAR

Exposure

- People can contract this disease from the bite of an infected tick or fly.
- People can also contract this disease when an open wound comes in contact with infected meat.

Symptoms

- Symptoms typically appear between 3 to 5 days, but sometimes as late as 14 days after exposure.
- Skin ulcers appear at the infection site.
- Lymph nodes in the area become swollen.

Recovery/Mortality Rate

- The disease is treatable with antibiotics.
- With treatment, fewer than 2 percent of victims die from this form of tularemia.

INHALATIONAL

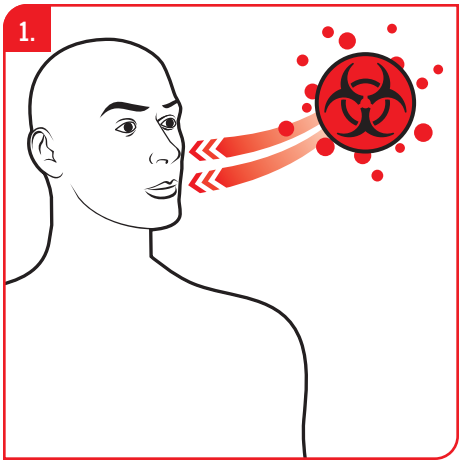
Exposure

The disease is contracted by inhaling the bacteria.

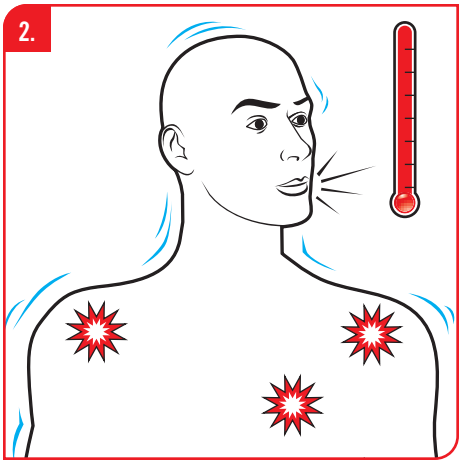
Symptoms

- Symptoms typically appear within 3–5 days but sometimes as late as 14 days after exposure.
- Early symptoms include sudden fever, chills, coughing, joint pain, weakness, and headaches, similar to the flu.
- Later symptoms include inflamed eyes, oral ulcers, severe pneumonia, chest pain, and respiratory failure.

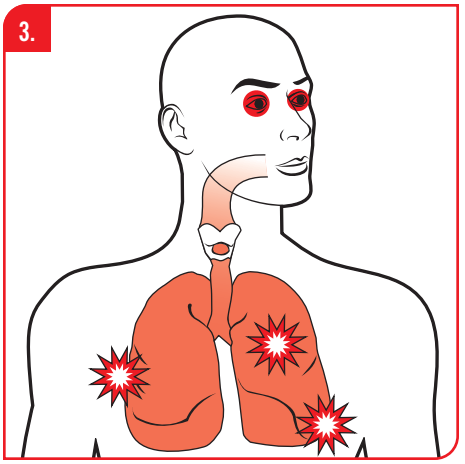
FIGURE 3–7: INHALATIONAL TULAREMIA



Tularemia bacteria inhaled.



Initial symptoms include sudden fever, chills, coughing, and aches.



Later symptoms include inflammation of the eyes, pneumonia, and chest pain.

Recovery/Mortality Rate

- This form of the disease is treatable by antibiotics.
- Inhalational tularemia has a 60 percent fatality rate if untreated.

TYPHOIDAL

Exposure

This is a secondary form of tularemia that develops after a victim has contracted inhalational tularemia.

Symptoms

- This form of tularemia attacks the circulatory system as well as the respiratory system.
- Symptoms include fever, extreme exhaustion, and weight loss.

Recovery/Mortality Rate

- This form of tularemia is treatable with antibiotics.
- The recovery rate is similar to that for inhalational tularemia.

DIAGNOSIS

All forms of tularemia are difficult to diagnose because early symptoms resemble those of the cold and flu.

- A rapid diagnostic test for tularemia does not exist.
- A chest X-ray may confirm inhalational tularemia.
- Blood tests can confirm the presence of tularemia bacteria.

TREATMENT

- All forms of tularemia can be successfully treated with antibiotics, including streptomycin, gentamicin, or doxycycline.
- The choice of antibiotics is determined by the patient's age and health and the availability of the drug when weighed against the number of cases in an area.
- Physicians prefer the injection of antibiotics for more effective results.

VACCINE

- An investigational vaccine for tularemia was developed but is currently unavailable. When it was in use, it was in limited distribution, mainly to lab workers.
- The vaccine is not useful for people who have already been exposed to tularemia.
- The current vaccine does not fully protect against inhalational tularemia.
- Research continues on a next-generation vaccine for inhalational tularemia; for more information, see NIAID's Web site (http://www2.niaid.nih.gov/biodefense).

PREVENTION

- Avoid contact with dead animals that may be infected.
- Decontaminate yourself with soap and water if you have come into contact with the bacteria.
- Decontaminate surfaces using solutions that are a combination of bleach and alcohol.

TULAREMIA HISTORICAL TIMELINE

1940s: The United States, the Soviet Union, and Japan study tularemia as a biological weapon.

1970s: Reports indicate that Soviets develop strain of tularemia resistant to antibiotics.

1972: At the Biological Weapons Convention, more than 100 nations agree not to produce or stockpile Weapons of Mass Destruction (including the United States).

1990s: Mass quantities produced by the Soviet Union in biowarfare program remain unaccounted for.

Summer 2000: An outbreak of pneumonic tularemia occurs on Martha's Vineyard, linked to brush and lawn cutting; 15 patients are successfully treated.

ASSESSING THE RISK

- Although the disease can occur naturally, it is rare, so the bacteria are only **moderately available.**
- Tularemia bacteria are **minimally stable,** since even moderate heat and disinfectants can kill the organism.
- Terrorists would have to be **highly skilled** to use tularemia in an attack because the bacteria are difficult to process and stabilize into a form that can do great harm. A waterborne attack would require too great of an amount of the bacteria to poison the water, since chlorine added to most drinking water would kill the bacteria.
- When treated with antibiotics, tularemia has a **low lethality.**

EXAMINING TULAREMIA—IS IT TERRORISM OR A NATURALLY OCCURRING DISEASE?

Whenever a case of an illness caused by a potential bioterrorism agent occurs, the media will ask, "Is this terrorism?" CDC's disease detectives, or epidemiologists, will also ask that question and will use what we know about these illnesses, and what we know about the new cases, to help answer the question. Since many of the Category A and B agents exist naturally in the United States, it is important to look closely at individual cases and outbreaks before jumping to any conclusions. Tularemia—a disease which has been reported in every state except Hawaii—is an example.

During 1990–2000, a total of 1,368 cases of tularemia were reported to CDC from 44 states, averaging 124 cases per year. Although cases have appeared nationwide, four states accounted for 56 percent of all reported tularemia cases: Arkansas, Missouri, South Dakota, and Oklahoma.

In the United States, most persons with tularemia acquire the infection from arthropod bites, particularly tick and deerfly bites, or from contact with infected mammals, particularly rabbits. Fifty years ago, most cases occurred during winter and were often related to rabbit hunting. Now, most cases occur in the late spring and summer months, when tick bites are most common. Outbreaks of tularemia in the United States have also been associated with muskrat handling, deerfly bites, and lawnmowing or cutting brush.

Although tularemia does occur in the United States, it is a rare disease, so every case will be carefully observed. To answer the question "Terrorism or nature?," epidemiologists will ask whether the case and patients follow the familiar patterns of the past. For example:

- Is the case in an area of the country where we usually see tularemia?
- Has the patient had contact with animals or been bitten by a tick or other arthropod?
- Is this a time of year when we usually see tularemia in that geographic area?

The CDC's National Notifiable Diseases Surveillance System is used to track data on cases of various diseases, including tularemia. From these types of data, baseline patterns emerge for comparison purposes. Outbreaks that do not fit the usual pattern may raise red flags. For example, if cases occur in a person with no known risk factors, there is an unusual pattern of symptoms, or a cluster of cases is seen in an unusual area of the country, such as a major metropolitan area, then concern about possible terrorism would be higher. A case of pneumonic tularemia, particularly in low-incidence areas, would also be of concern.

Sources:

Centers for Disease Control and Prevention. (2002). Tularemia—United States, 1990–2000. Morbidity and Mortality Weekly Report, 51(9), 182–184. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5109a1.htm.

Centers for Disease Control and Prevention. (2003). Endemic, notifiable bioterrorism-related diseases, United States, 1992–1999. Emerging Infectious Diseases, 9(5). http://www.cdc.gov/ncidod/eid/vol9no5/02-0477.htm.

VIRAL HEMORRHAGIC FEVERS (VHFs)

BASIC FACTS

Viral hemorrhagic fevers (VHFs) are a class of diseases, contracted from viruses, that include:

- **Ebola**
- **Marburg virus**
- **Other illnesses (e.g., Lassa, Machupo)**

The following are general characteristics of VHFs:

- **They are naturally occurring in mosquitoes, ticks, rodents, and other animals**
- **They cause massive internal and external bleeding**
- **The fatality rate can be as high as 90 percent**
- **With the exception of yellow fever and Argentine hemorrhagic fever, for which vaccines have been developed, no vaccines exists that can protect against these diseases**
- **No drugs are available to combat the viruses that cause VHFs**

VHFs AS A WEAPON

- In aerosol form, any of these viruses could be highly lethal.
- Soviet scientists are known to have weaponized the Marburg virus, a close cousin of Ebola.
- Many other VHFs have potential for aerosol dissemination or weaponization.

IDENTIFYING AN ATTACK

- Evidence of an attack would most likely come when patients fall ill.
- Because natural outbreaks of VHFs have been known to occur, investigators would have to rule out nonterrorist causes.

VHF ILLNESSES

EBOLA

Of all the VHFs, Ebola is probably the best known due to outbreaks in Africa.

Exposure

- Ebola can be passed to humans through infected animals.
- Once a person becomes ill, the virus can be transmitted to others through exposure to blood or bodily fluids, including airborne droplets from coughing.
- Outbreaks most often occur in areas where isolation of patients is difficult.

Symptoms

- Patients usually become sick 4–6 days after exposure.
- The disease attacks blood vessels and organs, particularly the liver, spleen, and kidneys, causing heavy bleeding.
- Symptoms include fever, vomiting, diarrhea, and heavy bleeding from multiple sites.

Recovery/Mortality Rate

- The fatality rates range from 50–90 percent.
- Death usually occurs within 1–2 weeks of falling ill, most often from shock and blood loss.

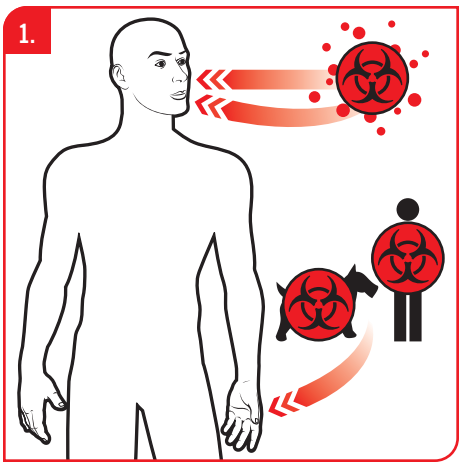
DIAGNOSIS

- Specific laboratory tests do exist to detect the virus in a blood sample.
- The handling of the virus is a biohazard, so tests need to be performed in a biosafety level 4 laboratory.
- Diagnosis is usually made by monitoring symptoms and by tracking a patient's exposure to the virus.

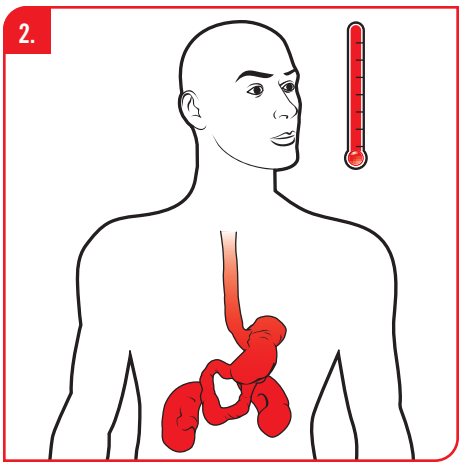
TREATMENT

Physicians treat the patient with fluids to prevent dehydration and try to control bleeding.

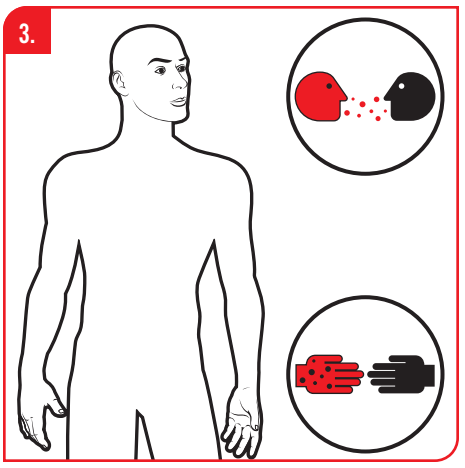
FIGURE 3–8: EBOLA



Ebola virus inhaled or transmitted through bodily fluids from an infected person or animal.



Symptoms include fever, vomiting, diarrhea, and heavy bleeding.



Ebola may be transmitted to others through bodily fluids (contagious).

VACCINE

- No vaccine currently exists for most VHFs.
- Research continues on a possible vaccine and antiviral drug treatments; for more information on clinical trials, see NIAID's Web site (http://www2.niaid.nih.gov/biodefense).
- Even under lab conditions, the virus is contagious, complicating vaccine research.

PREVENTION

Due to the contagious nature of Ebola, quick identification and isolation of victims is essential to containing the spread of it and other VHF diseases. While considered highly contagious, Ebola is spread only by direct contact with patients and their bodily fluids.

- Avoid infected animals or people.
- Isolate and monitor patients and people who have had close physical contact with patients.
- Hospital workers and caregivers must wear gowns, gloves, and masks and practice extreme caution while treating patients.
- Promptly bury or cremate patients who die from the disease because a corpse can be infectious for a period of time after death.

WHAT WE DON'T KNOW ABOUT EBOLA PREVENTION

- It is not known how long a person can remain contagious after recovering.
- Some research suggests that those patients who survive can continue to pass the disease to others through sexual contact for up to 7 weeks.

VHF HISTORICAL TIMELINE

1967: The Marburg virus is first recognized in laboratory workers in Marburg, Germany, and Belgrade, Yugoslavia; the workers had been exposed to tissues and blood from African green monkeys imported from Uganda.

1972: At the Biological Weapons Convention, more than 100 nations agree not to produce or stockpile Weapons of Mass Destruction (including the United States).

1976: The Ebola virus first emerges in two major disease outbreaks occurring almost simultaneously in Zaire and Sudan; more than 500 cases are reported, with a mortality rate of 80 percent.

1980s: Soviets weaponize the Marburg virus as an airborne powder and experiment on blending Ebola with smallpox.

1989: Monkeys imported from Africa to Reston, Virginia, test positive for Ebola, prompting an outbreak scare chronicled in the book "The Hot Zone."

1992: Japanese cult Aum Shinrikyo makes an unsuccessful attempt to obtain Ebola in Zaire.

1995: Ebola breaks out in Zaire, killing 244 of the 315 people infected.

1996: Ebola first surfaces in Gabon in the form of two outbreaks in February and July.

2000: Ebola outbreak in northern Uganda kills 173 people.

2001: Ebola kills 53 people in Gabon.

2004: A Russian scientist at a former Soviet biological weapons laboratory in Siberia dies after accidentally pricking herself with a needle laced with Ebola (showing how dangerous VHFs can be, even under lab conditions).

2005: Marburg outbreak confirmed in Angola, Africa.

ASSESSING THE RISK

- The ingredients to weaponize VHFs are **moderately available,** since naturally occurring outbreaks of Ebola could become a source for a terrorist organization. Some less virulent VHF viruses can be obtained from animals.
- VHFs are generally **minimally stable,** and few can be produced in aerosol form for widespread release.
- Terrorists would have to be **highly skilled** to weaponize VHFs since they are extremely dangerous to work with, even in the lab.
- VHFs are **highly lethal,** especially because there are no known vaccines or treatments to protect against most of them.

CATEGORY B AGENTS

Category B agents are defined by CDC as "second highest priority." Although these agents are fairly easy to disseminate, they generally cause moderate illness and low death rates. In most cases, scientists have experience with Category B agents as naturally occurring infectious diseases but do not know much about how they could be used as weapons by terrorists. Examples of Category B agents include *Salmonella*, *E. coli* O157:H7, Staphylococcus enterotoxin B, and ricin. Ricin is perhaps best known because it was sent through the mail to U.S. Senate office buildings in early 2004.

Basic facts and scientific information for Category B agents are provided; agents are treated alphabetically. Some categories of detail that appear in the Category A agents section do not appear here because the information available on some of these agents is limited.

B

BRUCELLOSIS

BASIC FACTS

- **Brucellosis is an infectious disease caused by the bacteria *Brucella* species (not a virus).**
- **These bacteria are mainly transmitted among animals (sheep, goats, cattle, deer, elk, pigs, dogs, and several others).**
- **Humans can contract brucellosis by coming into contact with infected animals (and unpasteurized milk from infected animals).**
- **Brucellosis is not very common in the United States.**
- **It is more common in countries where animal disease is high.**

BRUCELLOSIS AS A WEAPON

Scientists expect that terrorists would refine brucellosis into aerosol form for an open-air release.

WHAT WE DON'T KNOW ABOUT BRUCELLOSIS AS A WEAPON

Scientists are not sure if the bacteria that cause brucellosis can be aerosolized into a form that can cause mass casualties in an open-air or closed environment release.

BRUCELLOSIS ILLNESS

EXPOSURE

Humans can be infected three ways:

- Eating or drinking something contaminated with brucellosis (most common)
- Inhaling the organism (most common in laboratories or in a biological attack)
- Having the bacteria enter the body through open wounds

SYMPTOMS

- Human brucellosis symptoms include flu-like symptoms, including fever, sweats, headaches, back pains, and physical weakness.
- Severe infections to the central nervous system or lining of the heart can occur.
- Chronic or long-lasting symptoms may include recurrent fevers, joint pain, and fatigue.

RECOVERY/MORTALITY RATE

Recovery can vary from a few weeks to several months, depending on the timing of treatment and severity of the illness.

DIAGNOSIS

- Laboratory blood or bone marrow testing can detect *Brucella* organisms.
- A blood test can also be used to detect antibodies against the bacteria. This method requires that two blood samples be taken 2 weeks apart.

TREATMENT

The antibiotics doxycycline and rifampin are usually used in combination for 6 weeks to prevent reoccurring infection.

VACCINE

- Vaccines are available for the animal forms of brucellosis.
- There is no vaccine available for humans.

PREVENTION

- If food products have not been pasteurized, they should not be eaten.
- When handling animal carcasses, rubber gloves should be worn.

EPSILON TOXIN

BASIC FACTS

- **Epsilon toxin is produced by the bacteria *Clostridium perfringens* (not a virus).**
- **This toxin is a common cause of foodborne illness attributed to improper cooking, cooling, or holding of beef or chicken.**

EPSILON TOXIN AS A WEAPON

Could be used to contaminate the food supply, but this is not a toxin that could cause mass casualties.

WHAT WE DON'T KNOW ABOUT EPSILON TOXIN AS A WEAPON

Scientists do not know what concentrations would be needed to cause severe illness if this toxin were put into the food supply.

EPSILON TOXIN ILLNESS

EXPOSURE

People would most likely be exposed by eating tainted foods.

SYMPTOMS

Symptoms of the illness caused by epsilon toxin include severe stomach pain, diarrhea, nausea, and vomiting.

RECOVERY/MORTALITY RATE

- Most people recover within days with or without treatment.
- The illness from epsilon toxin can be fatal in some cases—for the elderly and those with compromised immune systems.

DIAGNOSIS

- Blood tests are used to determine the presence of the toxin.
- A stool sample test may help physicians make a diagnosis.

TREATMENT

The patient is given fluids to prevent dehydration.

FOOD SAFETY THREATS

OVERVIEW

There are a variety of bacteria that can affect food safety. Harnessed by terrorists, these could be used to poison the food supply and cause illness and death. Three examples are:

- ***E. coli* O157:H7**
- ***Salmonella***
- ***Shigella***

ESCHERICHIA COLI O157:H7 BASIC FACTS

- ***E. coli* O157:H7 is one of hundreds of strains of the bacteria *Escherichia coli* (not a virus).**
- **Most strains of *E. coli* are harmless and are found in healthy humans.**
- ***E. coli* O157:H7 is the most toxic of the strains and can cause severe illness and, in some cases, death.**

E. COLI ILLNESSES

EXPOSURE

- Eating raw or undercooked meat contaminated with *E. coli* O157:H7, especially ground beef, can expose a person to the bacteria.
- The bacteria can be passed by cows to milk and then to humans if the milk is not pasteurized.
- Eating contaminated raw vegetables, unpasteurized milk and juice, and swimming in or drinking sewage-contaminated water can also infect a person.
- *E. coli* O157:H7 can spread if an infected person does not wash his or her hands properly.

SYMPTOMS

- Symptoms appear from hours to days after exposure.
- The infection causes severely bloody diarrhea and abdominal cramps.
- A slight fever may be present.
- In young children under age 5 and the elderly, severe cases of O157:H7 may result in kidney failure. About 2–7 percent of infections lead to this complication.

RECOVERY/MORTALITY RATE

Most cases recover without antibiotics or other treatment in 5–10 days.

DIAGNOSIS

- *E. coli* O157:H7 can be diagnosed by testing a stool sample.
- Any person who suddenly has bloody diarrhea should seek medical attention.

TREATMENT

- Most cases of *E. coli* food poisoning are not O157:H7 and require no medical treatment.
- There is no evidence that antibiotics improve the course of this disease.
- Patients should not use over-the-counter medicines to combat diarrhea because diarrhea expels the bacteria from the body. However, replacing fluids to prevent dehydration is very important.
- Blood transfusions and kidney dialysis are required in the most severe cases of O157:H7.

VACCINE

There is no vaccine at this time.

PREVENTION

- Cook all ground beef and hamburger to an internal temperature of 160 degrees Fahrenheit.
- Keep raw meat away from ready-to-eat foods.
- Always wash hands, counters, and utensils that have touched raw meat.
- Wash raw produce under running water.
- Drink water that has been treated with chlorine or other disinfectants.
- Avoid swallowing lake or pool water while swimming.
- Wash hands to prevent the spread of the disease.
- People with diarrhea should avoid swimming in public pools or lakes, sharing baths, and preparing food for others.

SALMONELLOSIS BASIC FACTS

- **Salmonellosis is an infection from the bacteria called *Salmonella* (not a virus).**
- **There are many different types of *Salmonella* bacteria.**

SALMONELLOSIS AS A WEAPON

- An attack would be carried out by using the bacteria to contaminate the food supply.
- An attack would be identifiable if large numbers of people began getting sick.

SALMONELLOSIS ILLNESS

EXPOSURE

- Salmonellosis is usually spread to humans by eating foods contaminated with animal feces that contain the bacteria.
- Contaminated food usually looks and smells normal.
- Contaminated food is often meat, such as beef and poultry, or milk or eggs, but any food can be contaminated.

SYMPTOMS

- Symptoms usually develop 12–72 hours after infection.
- Symptoms include diarrhea, fever, and abdominal cramps.

RECOVERY/MORTALITY RATE

- Most people recover.
- This illness can be dangerous for the elderly and young children and those with compromised immune systems.

DIAGNOSIS

- A stool sample test can be used to detect salmonellosis (as with other bacterial infections).
- Once the test confirms salmonellosis, another test should be conducted to identify the type of salmonellosis.

TREATMENT

- Patients are given intravenous (IV) fluids in extreme cases to prevent dehydration.
- If the infection has spread from the intestines to other parts of the body, the patient may be prescribed antibiotics, such as ampicillin; gentamicin; trimethoprim/sulfamethoxazole (TMP–SMX), an antibiotic commonly known by the brand names of Bactrim™ and Septra™; or ciprofloxacin.
- Once the type of salmonellosis has been identified, the doctor can prescribe the appropriate antibiotic.

VACCINE

There is no vaccine at this time.

PREVENTION

- Avoid eating raw or undercooked eggs, poultry, or beef.
- Cook poultry and beef to an internal temperature of 160 degrees Fahrenheit.
- Avoid eating or drinking unpasteurized dairy products.
- Thoroughly wash produce.
- Always wash hands, counters, and utensils that have touched raw meat.

SHIGELLOSIS BASIC FACTS

- **Shigellosis is an infection caused by the bacteria Shigella (not a virus).**
- ***Shigella* is present in the diarrheal stools of infected persons.**

SHIGELLA AS A WEAPON

The bacteria would be used to infect food or water.

SHIGELLOSIS ILLNESS

EXPOSURE

- *Shigella* is ingested or enters the body through an open wound.
- Most *Shigella* infections are the result of the bacterium passing from stools or soiled fingers of one person to the mouth of another person (i.e., if someone does not wash his or her hands properly after a bowel movement and handles food).
- Flies can breed in infected feces and thus spread contamination to food.
- People swimming in water contaminated by sewage runoff or by a sick person can be exposed to the bacteria.

SYMPTOMS

- Symptoms usually occur 1–2 days after a person is exposed to the bacteria.
- Symptoms include diarrhea (often bloody), fever, and stomach cramps.
- A severe infection may include high fever and children younger than 2 years old may experience seizures.
- In some cases, an infected person may experience no symptoms but he or she can still spread the bacteria to others (see "Exposure" section above).

RECOVERY/MORTALITY RATE

Shigellosis usually resolves in 5–7 days.

DIAGNOSIS

- A stool sample test can detect the presence of the bacteria.
- Another stool test can identify the type of strain so appropriate medication can be prescribed.

TREATMENT

- A patient is given plenty of fluids to prevent dehydration. In severe cases, treatment is administered in the hospital.
- The following antibiotics are commonly used to treat shigellosis: ampicillin; trimethoprim/sulfamethoxazole (TMP–SMX), an antibiotic commonly known by the brand names of Bactrim™ and Septra™; nalidixic acid; or ciprofloxacin.
- Medicine to control diarrhea can make the illness worse.

VACCINE

There is no vaccine at this time.

PREVENTION

- Wash hands with warm water and soap for at least 15 seconds to stop the spread of shigellosis.
- Regularly disinfect diaper changing areas used for an infected child.
- Put diapers of an infected child in a closed-lid garbage can.

GLANDERS

BASIC FACTS

- **Glanders is the disease caused by the bacterium *Burkholderia mallei* (not a virus).**
- **Glanders primarily affects horses, mules, and donkeys but can infect humans.**
- **Glanders is stable in the environment.**
- **Glanders is an extremely rare disease.**

GLANDERS AS A WEAPON

- The bacteria are highly lethal in aerosol form.
- Only a few particles of the bacteria can make someone sick.
- The Germans used glanders in World War I against attacking cavalry.
- Soviet bioscientists experimented with the bacteria.

WHAT WE DON'T KNOW ABOUT GLANDERS AS A WEAPON

- Scientists know the bacteria that cause glanders can be put in aerosol form but are not sure how long they would survive in an outdoor release.
- Scientists do not know how long the bacteria would be infectious in an indoor release.

GLANDERS ILLNESS

EXPOSURE

- People are exposed by breathing in an aerosolized form of the bacteria.
- The bacteria can also enter the body through an open cut.
- Glanders can be passed from person to person but is not considered highly contagious.
- Because the disease is so rare, scientists are not sure how close the person-to-person contact needs to be to spread the disease.

SYMPTOMS

- Symptoms begin 1–4 days after exposure.
- Symptoms include fever, headaches, muscle tightness, and chest pain.
- Symptoms progress to swollen lymph nodes, watery eyes, and sensitivity to light.
- If the bacteria enter the body through a cut, a pustular lesion appears in 1–5 days.
- In severe cases, pneumonia develops.

RECOVERY/MORTALITY RATE

Glanders is highly lethal, killing 50 percent of those exposed.

DIAGNOSIS

- Symptoms of glanders resemble those for a cold or the flu.
- There is no single test to confirm glanders.

TREATMENT

- Glanders is treated with amoxicillin; tetracycline; and trimethoprim/sulfamethoxazole (TMP–SMX), an antibiotic commonly known by the brand names of Bactrim™ and Septra.™
- Even with treatment, the mortality rate is high (roughly 50 percent).
- No vaccine is available at this time.

MELIOIDOSIS

BASIC FACTS

- **Melioidosis is an uncommon disease caused by the bacterium *Burkholderia* (not a virus).**
- **Melioidosis is also called Whitmore disease.**
- **There is no evidence that melioidosis is contagious.**

MELIOIDOSIS AS A WEAPON

- These bacteria would be most effective in aerosol form.
- The bacteria could also be used to poison the food or water supply.
- The bacteria are found naturally in soil and water.

WHAT WE DON'T KNOW ABOUT MELIOIDOSIS AS A WEAPON

- Scientists are not sure if any countries have experimented with melioidosis as a biological weapon.
- Scientists are not sure how an aerosol version of the bacteria might affect the population.
- Scientists are not sure if a waterborne attack can be prevented by chlorination in the water or what amounts would have an impact.

MELIOIDOSIS ILLNESS

EXPOSURE

Victims breathe in or ingest the bacteria.

SYMPTOMS

- Symptoms of melioidosis include dry cough, fever, and pneumonia.
- Later symptoms can include a fatal blood infection (septicemia).

RECOVERY/MORTALITY RATE

With treatment, patients can recover but some can suffer from the after effects of the illness for up to 25 years after exposure.

DIAGNOSIS

- Blood tests can eventually confirm melioidosis.
- Physicians may suspect melioidosis if the patient has traveled to or lived in southeast Asia.

TREATMENT

- The most effective treatment for melioidosis is trimethoprim/sulfamethoxazole (TMP–SMX), an antibiotic commonly known by the brand names of Bactrim™ and Septra.™
- The antibiotics gentamicin and amoxicillin are also prescribed to treat melioidosis.
- There is no vaccine for melioidosis.

PSITTACOSIS

BASIC FACTS

- **Psittacosis is a disease caused by the microorganism *Chlamydia psittaci* (not a virus)—different from the Chlamydia species causing sexually transmitted disease.**
- **It is transmitted to humans from birds.**
- **It is most commonly referred to as parrot fever.**
- **Human-to-human transmission is rare.**

PSITTACOSIS AS A WEAPON

- There is no evidence that countries with biological weapons programs have experimented with psittacosis in an aerosol form.
- In most cases, this disease is not fatal.

WHAT WE DON'T KNOW ABOUT PSITTACOSIS AS A WEAPON

- Scientists do not know if an outbreak of this illness could be engineered by terrorists.
- Scientists do not know if a more potent strain has been harnessed to be effective as a bioweapon.

PSITTACOSIS ILLNESS

EXPOSURE

- People are exposed by inhaling respiratory secretions or dust from dried droppings of infected birds.
- This disease is most common in pet shops, on farms, or at slaughterhouses.
- People can be exposed by having an infected bird as a pet.

SYMPTOMS

- Symptoms can appear from 5 to 28 days after exposure.
- Most symptoms appear 10 days after exposure.
- Symptoms include fever, headache, chills, and muscle aches.
- In severe cases, a patient develops pneumonia.

RECOVERY/MORTALITY RATE

- The disease is usually mild in humans.
- The disease can be more severe in those with diabetes.
- The disease can be fatal in elderly people who do not receive treatment.

DIAGNOSIS

- The disease is difficult to diagnose because it resembles the flu.
- The diagnosis is most often confirmed by testing for antibodies.

TREATMENT

- Physicians should ask for a travel history and about exposure to pet birds.
- Tetracycline or doxycycline are the preferred antibiotics.

PREVENTION

- Identifying and isolating an exposed bird is the key to containment.
- Treatment of infected birds should be supervised by a veterinarian.
- Strict import and quarantine laws keep rare birds in isolation so they cannot infect humans.

Q FEVER

BASIC FACTS

- **Q fever is a disease caused by the bacteria *Coxiella burnetti* (not a virus).**
- **The bacteria are resistant to heat and many common disinfectants.**
- **The bacteria can survive for long periods of time in the environment.**
- **Farm mammals, such as sheep, goats, and cattle, are carriers of the bacteria that cause the Q fever illness. The bacteria are present in urine, feces, and milk and are shed in high numbers from amniotic fluid and placental tissue during birthing.**

Q FEVER AS A WEAPON

- This is a highly infectious disease.
- Inhaled, the bacteria can be very dangerous to humans.
- One single organism can cause illness.
- It is possible to produce this in aerosol form for an airborne release.
- These bacteria are less likely to be used to infect the food or water systems.

WHAT WE DON'T KNOW ABOUT Q FEVER AS A WEAPON

Scientists are not sure how effective a foodborne release would be or what quantities would be required for such a release to be effective.

Q FEVER ILLNESS

EXPOSURE

- Humans are exposed by inhaling infected barnyard dust.
- People can be exposed during the birth of an animal.
- People can also be exposed by drinking contaminated milk.
- Sometimes infected ticks carry the bacteria and can transmit the bacteria to humans, but ticks are not the principle means of infection.

SYMPTOMS

- Symptoms occur 2–3 weeks after exposure.
- Symptoms include high fever (104–105 degrees Fahrenheit).
- Symptoms also include sore throat, headache, chills, general aches, and sweats (similar to flu symptoms).
- Later symptoms may include diarrhea, vomiting, and chest pain.

RECOVERY/MORTALITY RATE

- The fever normally lasts up to 2 weeks.
- During this time, there is weight loss.
- Without treatment, only 1–2 percent of those infected die.
- Most people recover in several months.
- Complications include hepatitis and an inflammation around the heart.
- A chronic form of the disease can last as long as 20 years after the initial infection. Chronic Q fever affects the heart and is often fatal; it most often strikes those with preexisting heart valve disease or a history of bypass surgery.
- Once a person has Q fever, he or she may maintain lifelong immunity.

DIAGNOSIS

- There is no single test to diagnose Q fever.
- Doctors analyze blood tests to isolate the bacteria, their DNA, or antibodies indicating an infection.

TREATMENT

- Doxycycline is the antibiotic of choice to treat acute Q fever.
- Chronic Q fever typically requires multiple antibiotics given over a prolonged period of time.
- The antibiotic is most effective when given within 3 days of the first symptoms and for 21 days thereafter.

VACCINE

A vaccine is in limited use for researchers working with animals but it is not currently available in the United States.

PREVENTION

- Pasteurization of milk minimizes the risk of Q fever.
- Animal testing and quarantine can prevent transmission to humans.

RICIN TOXIN

BASIC FACTS

- **Scientific name: *Ricinus communis;* a biological toxin.**
- **Ricin can be made from the waste left over from processing castor beans.**
- **Ricin can take powder, mist, or pellet form, or it can be dissolved in water.**
- **Ricin has some potential medical uses, such as in bone marrow transplants and cancer treatment.**
- **The illness resulting from ricin poisoning is not contagious.**

Note: Ricin is classified by CDC as both a chemical and a biological agent because it is a chemical toxin but has a biological source (unlike other chemical agents, such as sarin).

RICIN TOXIN AS A WEAPON

- Ricin can be processed into a powder that could then be aerosolized.
- People would become sick after breathing in the substance.
- Pellets of ricin or ricin dissolved in a liquid can be injected into people's bodies.
- Ricin can also contaminate water or food and then be swallowed.

WHAT WE DON'T KNOW ABOUT RICIN TOXIN AS A WEAPON

Scientists are not sure how much ricin is needed in an aerosol release to cause mass casualties or how long it remains viable in the environment.

IDENTIFYING AN ATTACK

- Almost any ricin illness would be considered an attack, since accidental ricin poisoning is extremely unlikely.
- Evidence of an attack would be numerous cases of illness by people who have been in the same location or attended the same event.

RICIN TOXIN ILLNESS

Ricin works by getting inside the cells of a person's body and preventing the cells from making the proteins they need. Without the proteins, cells die. Eventually this is harmful to the whole body, and death may occur.

EXPOSURE

Ricin can be inhaled, ingested, or injected.

SYMPTOMS

Inhalation

- Initial symptoms occur within 8 hours of exposure and include difficulty breathing, fever, cough, nausea, and tightness in the chest.
- Later symptoms include heavy sweating and fluid buildup in the lungs (making breathing even more difficult), and the skin might turn blue. Low blood pressure and respiratory failure may result, leading to death.

Ingestion

- Initial symptoms occur within 6 hours and include vomiting and bloody diarrhea. Severe dehydration may result, followed by low blood pressure.
- Later symptoms may include hallucinations, seizures, and blood in the urine. Within several days, the person's liver, spleen, and kidneys might stop working, and the person could die.

Injection

- A tiny amount of ricin (the size of a pinhead) is enough to cause death, such as in the 1978 case in London in which ricin was used on the tip of an umbrella to assassinate a Bulgarian exile.
- Ricin immediately kills the muscles and lymph nodes near the site of the injection.
- Failure of the major organs and death usually follow within 4 days.

RECOVERY/MORTALITY RATE

- Chances of death depend on the method of exposure and dose of toxin received.
- If the dose is sufficient, death from ricin poisoning could occur within 36–72 hours of exposure.
- If death has not occurred in 3–5 days, the victim usually recovers.

DIAGNOSIS

- No reliable test exists to confirm ricin exposure.
- Tracking symptoms of those suspected of being exposed could lead to a diagnosis.
- An X-ray could confirm fluid in the lungs.

TREATMENT

- No antidote exists to counteract the effects of ricin poisoning.
- Victims are given intravenous (IV) fluids and assisted with breathing, possibly with a ventilator.
- Medications to control low blood pressure and seizures may also be administered.
- Those who have recently ingested ricin may have their stomachs flushed with activated charcoal to keep the toxin from being absorbed into the body.
- Eyes that come in contact with ricin should be flushed with water.

VACCINE

No vaccine exists to protect against ricin poisoning.

PREVENTION

- Leave the area of a known ricin release to prevent exposure.
- If exposed, remove clothing and shower thoroughly with soap and water.

STAPHYLOCOCCAL ENTEROTOXIN B (SEB)

BASIC FACTS

- **Staphyloccal enterotoxin B (SEB) is one of the toxins linked to foodborne illness.**
- **SEB is produced naturally by the *Staphylococcus aureus* bacteria (not a virus).**
- **SEB is not contagious.**

SEB AS A WEAPON

- SEB is produced in aerosol form for easy dissemination in the air or in a building's ventilation system.
- SEB can also be released in food or water.

WHAT WE DON'T KNOW ABOUT SEB AS A WEAPON

Scientists do not know how much of the toxin is needed in an aerosol release to inflict mass casualties.

SEB ILLNESS

EXPOSURE

SEB illness develops after the toxin is inhaled or ingested.

SYMPTOMS

- Symptoms appear 3–12 hours after exposure.
- Symptoms of inhaled exposure include fever, chills, and headache, similar to flu symptoms.
- Symptoms of ingested exposure include nausea, vomiting, and diarrhea, similar to stomach virus symptoms.

RECOVERY/MORTALITY RATE

- Higher mortality rates of 50–80 percent occur after inhalation of the toxin.
- Most patients recover from ingested forms of the toxin.
- The progression of the disease depends on the route of exposure and the dose of the toxin.

DIAGNOSIS

- Respiratory symptoms will signal when a patient may have inhaled the toxin.
- Tests of respiratory secretions can detect the toxin.
- Evidence of the toxin can be found in blood and urine.
- SEB is quickly identified in food.

TREATMENT

- Patients with severe cases resulting from aerosol exposure may require a ventilator.
- A vaccine is currently not available but is under development. For more information, see NIAID's Web site (http://www2.niaid.nih.gov/biodefense).

TYPHUS FEVER (EPIDEMIC OR LOUSE-BORNE TYPHUS)

BASIC FACTS

- **Caused by the bacterium *Rickettsia prowazekii* (not a virus).**
- **The disease is spread from person to person by body lice. (Not to be confused with typhoid fever, which is spread by unrelated bacteria.)**

WHAT WE DON'T KNOW ABOUT TYPHUS FEVER AS A WEAPON

It is not known to what extent scientists have explored the use of typhus in other forms that would be more deadly for use in a mass casualty event.

TYPHUS FEVER ILLNESS

EXPOSURE

- People are infected when exposed to body lice from other infected individuals.
- A less severe disease, murine typhus, is spread via fleas from infected mice, rats, and some other animals. Murine typhus is caused by different but related bacterium, *Rickettsia typhi*.
- This Louse-borne typhus is not contagious except as spread by lice.

SYMPTOMS

- Symptoms appear 1–2 weeks after exposure.
- Symptoms include fever, headache, chills, and general pains.
- Initial symptoms are followed by a body rash, typically beginning around the armpits or upper trunk and spreading outward.
- The rash typically does not appear on the face, the palms of the hands, or the soles of the feet.

RECOVERY/MORTALITY RATE

- The recovery rate is good (except in high outbreak areas) if antibiotic treatment begins quickly.
- Left untreated, the disease kills up to 40 percent of infected individuals; those who recover typically undergo a 2–3 month convalescence.
- In some individuals, typhus may arise spontaneously many years after recovery from an infection. This illness, called Brill-Zinsser disease, appears to be caused by reactivation of a dormant infection and is typically milder than the initial disease.

DIAGNOSIS

Typhus is diagnosed by a variety of blood tests.

TREATMENT

Doxycycline is the most prescribed antibiotic of choice for typhus illness. Some other antibiotics are also effective.

PREVENTION

- Typhus can be prevented by delousing and improved hygiene.
- There is no U.S. Food and Drug Administration-approved vaccine for epidemic typhus.

VIRAL ENCEPHALITIS

BASIC FACTS

- **The majority of cases of "encephalitis" are caused by viruses (not bacteria).**
- **Several different types or families of viruses can cause encephalitis.**
- **The term "encephalitis" only refers to inflammation of the brain. "Encephalomyelitis," which refers to inflammation of the brain and spinal cord, is a term that may also be used since most cases of viral encephalitis also involve the spinal cord. These illnesses are different than "meningitis," which refers to inflammation of the covering (meninges) of the brain.**
- **Many "encephalitis viruses" are arthropod-borne viruses (arboviruses), typically transmitted to humans and animals via the bits of mosquitoes, ticks, and sandflies. However, many other infectious agents, such as mumps, measles, adenoviruses, enteroviruses, herpesvirus, and rabies, can also cause encephalitis. These agents will not be discussed here.**
- **Many outbreaks of viral encephalitis, particularly those associated with mosquito transmission, occur naturally and have a seasonal pattern (often more cases in late summer when more vectors [e.g., insects] are present).**
- **The most common mosquito-borne viral encephalitis infections are:**
  - **Alphaviruses—Eastern equine encephalitis (EEE), Venezuelan equine encephalitis (VEE), and Western equine encephalitis**
  - **Flaviviruses—St. Louis encephalitis, West Nile virus encephalitis, Japanese encephalitis, tick-borne encephalitis, and dengue encephalitis**
  - **Bunyavirus—Rift Valley encephalitis**

VIRAL ENCEPHALITIS AS A WEAPON

- Viral agents causing encephalitis could be weaponized relatively easily. Many encephalitic viruses, such as VEE, can be aerosolized.
- VEE and EEE are two examples of viruses that are thought to have been weaponized.
- Viral agents causing encephalitis may be attractive as weapons because they are available in nature and could cause disease outbreaks initially indistinguishable from naturally occurring outbreaks. If aerosolized viral agents were introduced into areas where there are insects capable of transmitting disease, there could be a secondary transmission of the disease (i.e., an insect first bites an infected person and then bites another person, thereby spreading the disease).
- These viruses are zoonotic—capable of causing infection in humans and animals, such as horses.

WHAT WE DON'T KNOW ABOUT VIRAL ENCEPHALITIS AS A WEAPON

We have limited intelligence information on the current weaponization of specific agents causing viral encephalitis.

VIRAL ENCEPHALITIS ILLNESSES (CAUSED BY AN ARBOVIRUS)

EXPOSURE

- Under natural conditions, an individual would be bitten by an insect, which could introduce the virus into the body. If there are a large number of vectors (e.g., insects) that carry the virus and are capable of transmitting it to people, there is a greater likelihood of an outbreak of the disease.
- For laboratory workers working with such viruses, the aerosolization of infectious virus particles is a concern and lab safety and personal protective safeguards are necessary.
- In a bioterrorist scenario where the viral agents are aerosolized, the impact of the attack will probably be dependent on the number of people exposed, the amount of virus they are exposed to, and any preexisting immunity of the population.

SYMPTOMS

- Depending on the specific virus, the amount of virus introduced into the body, and the individual's state of immunity, symptoms may vary from none to drowsiness, headaches, stiff neck, confusion, seizures, coma, and death. Depending on the specific agent, the incubation period may vary from 2 to 3 weeks.
- In many cases of naturally occurring infection, the body's immune system fights off the infection. In many cases, there may be only mild symptoms, such as fever or headache or malaise, and the diagnosis is often missed. Individuals with compromised immune systems, such as infants and the elderly, may be at greater risk of developing complications.

RECOVERY/MORTALITY RATE

- Severity of disease and mortality rate are dependent on the particular virus infection. For example, EEE has been associated with a high mortality rate (50–80 percent) in older populations.
- Recovery is usually gradual, but residual effects of the infection may occur. These include disturbances in cognitive function, restlessness, recurring seizures, and personality changes.

DIAGNOSIS

- Viral encephalitis can be diagnosed through blood tests, viral cultures, and a spinal tap.
- An MRI or CAT scan may also be used for diagnosis.

TREATMENT

- Unlike bacteria, viral infections cannot be specifically treated with antibiotics.
- There are no licensed therapies for arboviral infections at this time, although certain drugs and therapies under Food and Drug Administration investigational use may be available, if needed.
- Treatment for arboviral encephalitis is supportive care (hospitalization, intravenous fluids, respiratory support, prevention of secondary infections, etc.).
- Various chemical compounds are being evaluated for possible antiviral activity against arboviruses.

VACCINE

- A licensed vaccine for Japanese Encephalitis is currently available in the United States.
- Vaccines against EEE, Western equine encephalitis, VEE, and Rift Valley encephalitis were developed by the U.S. Department of Defense and are available under specific investigational drug protocols through the U.S. Army Medical Research Institute of Infectious Diseases at Fort Detrick, Maryland.
- No licensed vaccines are available in the United States for viruses causing encephalitis, with the exception of rabies, mumps, and measles vaccines. Vaccines are under development against several arboviruses (EEE, Western equine encephalitis, VEE, tick-borne encephalitis, and West Nile virus).

PREVENTION

- In a bioterrorist attack, it is unlikely that the virus could survive very long (more than a few hours) outside of the body.
- Vector control measures (e.g., elimination of insect breeding sites) will reduce the risk of mosquito-borne disease.
- Personal protective measures, such as the use of insect repellents and appropriate clothing (e.g., shirts with long sleeves), will reduce the risk of bites.

WATER SAFETY THREATS

OVERVIEW

While not all are discussed in this guide, some examples of water-borne contaminants that pose threats include:

- **Cholera**
- **Giardiasis**
- **Cryptosporidiosis**

WATER SAFETY THREATS BASIC FACTS

- **There are several bacteria or parasitic organisms that can contaminate the water and make people sick.**
- **Diagnosis would most likely occur after large numbers of people begin getting sick with intestinal symptoms, including nausea and diarrhea.**
- **Symptoms usually occur within hours or days of exposure. Community water systems that do not filter their water or that inadequately disinfect drinking water are more likely to transmit disease-causing organisms.**
- **The most well-known of these diseases is cholera.**

CHOLERA BASIC FACTS

- **Cholera is an acute, diarrheal illness caused by infection of the intestine with the bacterium *Vibrio cholerae* (not a virus).**
- **Cholera can be highly lethal if untreated, but the mortality rate is low with treatment.**
- **The disease can spread rapidly in areas with inadequate treatment of sewage and drinking water.**
- **Cholera bacteria can also live in brackish rivers and coastal waters.**
- **Cholera is unstable in fresh water but remains vibrant in salt water.**

WHAT WE DON'T KNOW ABOUT CHOLERA AS A WEAPON

In most areas, chlorination and aeration of water kills the bacteria that can make people sick. Scientists do not know if terrorists have experimented with ways to infect the water systems that can withstand the chlorine treatment to inflict mass illnesses.

CHOLERA ILLNESS

EXPOSURE

- A person can become infected by drinking water or eating food contaminated with the cholera bacteria.
- In an epidemic, the source of contamination is usually the feces of an infected person contaminating the water supply.

SYMPTOMS

- Infection is often mild and no symptoms may occur.
- Approximately 1 in 20 infected people has a severe case, which is characterized by profuse watery diarrhea, vomiting, and leg cramps.
- In severe cases, the rapid loss of bodily fluids leads to dehydration and shock.

RECOVERY/MORTALITY RATE

- Without treatment, death can occur within hours.
- With prompt rehydration, fewer than 1 percent of cholera patients die.

DIAGNOSIS

- Physicians ask for a travel history from the patient to see if he or she has traveled to a known outbreak area.
- A stool sample test can confirm cholera.

TREATMENT

- Patients are treated with fluids to replace those lost due to diarrhea.
- Most patients are given large amounts of a water, sugar, and salt mixture to drink.
- More severe cases also require administration of intravenous (IV) fluids.
- Antibiotics shorten the course and diminish the severity of the illness, but they are not as important as rehydration.

VACCINE

There is no cholera vaccine currently available in the United States. However, there are vaccines widely available in countries where cholera is a major public health problem.

PREVENTION

Travelers to areas where cholera has occurred should observe the following recommendations:

- Drink only water that you have boiled or treated with chlorine or iodine; other safe beverages include tea and coffee made with boiled water and carbonated, bottled beverages with no ice
- Eat only foods that have been thoroughly cooked and are still hot or fruit that you have peeled yourself
- Avoid undercooked or raw fish or shellfish, including ceviche (raw fish salad)
- Make sure all vegetables are cooked; avoid salads
- Avoid foods and beverages from street vendors
- Do not bring perishable seafood back to the United States

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CHEMICAL AGENTS

04

CHEMICAL AGENTS

GOAL OF THIS SECTION

To provide details on chemical agents that could be used by terrorists.

WHAT THIS SECTION INCLUDES

- **Categories of agents are provided with examples from each category. The U.S. Department of Health and Human Services' (HHS) Centers for Disease Control and Prevention (CDC) use the impact that chemical agents have on the human body to categorize them. For example, nerve agents affect the central nervous system, while choking agents affect breathing.**

WHAT THIS SECTION DOES NOT INCLUDE AND WHY

- **All possible chemical agents that could be used in an attack are not included here. This section provides one or two examples of four major types of chemical agents. A detailed description of more chemical agents can be found on CDC's Web site, (http://www.bt.cdc.gov/agent/agentlistchem.asp).**
- **This section will not focus on the specific amounts of an agent that will make people sick. There are too many variables in how a chemical weapon could be delivered. However, this section will address exposure and treatment in more general terms.**
- **Detailed information on toxic industrial chemicals are not included. Though a terrorist may use toxic industrial chemicals in an attack (e.g., by causing a truck containing toxic chemicals to explode, or by attacking a chemical plant), any one of thousands of industrial chemicals could be used in this way. However, the federal response to an attack or accident involving industrial chemicals will be similar to the federal response to the chemical agents as described in this guide (see p. 141).**
- **Ricin and other biological toxins are not covered in this section. Ricin is classified as a chemical agent, as well as a biological agent, because it is a toxin but it has a biological source (unlike sarin or other chemical agents). Details on ricin can be found in the "Biological Agents" section (see p. 39).**

Please note: Information on the use of personal protective equipment (e.g., biohazard suits and masks) can be found in the "Self-Care for Media" section (see p. 157).

BASIC FACTS

This section discusses four major types of chemical agents, grouped according to how they affect the human body:

- Blister (e.g., mustards)
- Blood (e.g., cyanides)
- Choking (e.g., chlorine)
- Nerve (e.g., sarin, VX agents)

Other categories of chemicals include:

- Biotoxins
- Caustics (acids)
- Incapacitating agents
- Long-acting anticoagulants
- Metals
- Organic solvents
- Riot control agents/tear gas
- Toxic alcohols
- Vomiting agents

For more information on these other chemical categories, please see http://www.bt.cdc.gov.

- Chemical agents can come in the form of poisonous gases, liquids, or solids.

- These agents are usually fast acting and toxic to people, animals, or plants. (Note: A major exception is mustard agents for which symptoms appear several hours after exposure.)
- Poisoning by chemicals is not contagious. However, if residual chemical agents or vapors are on the skin, clothing, hair, or in biologic fluids (such as vomit), others can be exposed and affected. Once the agent is removed (e.g., by removing clothing and showering), the illness caused by a chemical agent cannot be spread.

CHEMICAL AGENT HISTORIC TIMELINE

1914–1918 (World War I): Mustard gas, phosgene, and chlorine are introduced for chemical warfare.

1939–1945 (World War II): Germans use hydrogen cyanide as a genocidal agent. Germans use chlorine in World War II as a chemical weapon.

1980s: Iraq uses cyanide against Kurds in Northern Iraq.

1981–1988: Iraq uses mustard gas and nerve agents in the Iran-Iraq war.

1995: Aum Shinrikyo cult in Japan releases sarin in Tokyo subway.

ASSESSING THE RISK

- Because certain chemical agents are used in industry and household products, they are **highly available.**
- After an outdoor release, the dangers associated with many chemical agents **decrease over time** because the chemical gets diluted as it spreads over a given area.
- Terrorists could be **minimally skilled** to launch a limited chemical attack. A more widespread attack would require more expertise.
- How **lethal** an attack is depends on several factors, including amount and type of agent used, route of exposure, time elapsed before decontamination, and access to medical care.

CHEMICAL AGENTS AS WEAPONS

- Sufficient quantities must be used for chemical weapons to be effective.
- Weather factors have an impact on the effectiveness of an open-air release. These factors include:
  - Temperature
  - Wind speed and direction
  - Humidity and air stability
- Chemical agents are typically more deadly in confined or crowded areas, such as buildings, subways, or battlefields, where evacuation options are limited.
- Chemical agents can be deployed in five ways:
  - Spraying the chemical with wet or dry aerosol sprayers (e.g., crop dusters, handheld spraying devices)
  - Using a heat source to vaporize the chemical for release
  - Using an explosive device to disperse the chemical
  - Pouring the chemical on a specific site (e.g., building floor, sidewalk, subway platform)
  - Contamination of food, water, or pharmaceuticals (such as the 1982 intentional contamination of acetaminophen products with cyanide)

IDENTIFYING AN ATTACK

- A chemical release may result in environmental clues, including:
  - Dead plants, animals, or insects
  - Pungent odor
  - Unusual clouds, vapors, or droplets
  - Discoloration of surfaces
- Some common immediate physical symptoms from an airborne attack may include:
  - Tightness in chest and difficulty breathing
  - Nausea and vomiting
  - Watery eyes and blurry vision
- A chemical attack is different from a biological attack in the following ways:
  - It is often an easily identifiable incident (e.g., chemical release from a fire at an industrial manufacturing facility)
  - Signs and symptoms appear rapidly after exposure (usually within minutes)
  - Victims are not contagious, although rescue workers can become ill if there is still residual chemical on the patient's clothes or skin, or in biologic fluids, and they are exposed to these agents without proper personal protective equipment (e.g., gloves and masks)

LESSENING THE IMPACT OF EXPOSURE (TO CHEMICAL AGENTS IN GENERAL)

- Follow the instructions of emergency workers, if possible.
- Move away from the site of release (if known) during an outdoor release or go indoors.
- Shelter-in-place if indoors near an outdoor release.
- Evacuate the affected building during an indoor release.
- If exposed, remove contaminated clothing and place in a plastic bag.
- Wash with soap and water (when appropriate).
- Flush eyes with water (when appropriate).
- Seek medical attention if you have breathed in chemical fumes or if chemicals have touched your skin.
- Patients should be decontaminated if they have chemicals on their clothes and/or skin (when appropriate).
- If medically indicated and available, get appropriate antidote(s).
- Consider using protective masks and clothing to minimize exposure.
- Whenever possible, get emergency personnel in protective gear to assist in the removal of contaminated clothing.

INSTRUCTIONS TO SHELTER-IN-PLACE AND SEAL THE ROOM DUE TO CHEMICAL INCIDENTS

If you have been exposed:

- **Remove contaminated clothing if coming from outside and seal it in a plastic bag**
- **Shower and wash with soap, if possible**

To shelter-in-place and seal the room:

- **Find a room with as few windows and doors as possible**
- **Go to the *highest* level possible**
- **Turn off the air conditioner, heater, and fans**
- **Close the fireplace damper**
- **Fill sinks and tubs with water**
- **Turn on the radio for instructions**
- **Keep a telephone handy**
- **To seal the room, tape plastic over windows and doors; seal with duct tape. Tape over vents and electrical outlets (and any other openings)***

*** Within a few hours, the plastic and tape may need to be removed to allow fresh air to enter the room to prevent suffocation. *Follow the instructions of emergency workers and/or public health officials.***

SHELTER-IN-PLACE* SUPPLY LIST

(Maintain enough for 3 days; check supplies every 6 months)

- **Food**
- **Bottled water (1 gallon per day per person, plus water for pets)**
- **Change of clothing (including undergarments)**
- **Shoes**
- **First aid kit**
- **Paper goods and plastic utensils**
- **Plastic garbage bags**
- **Bedding**
- **Battery-operated radio**
- **Batteries**
- **Flashlight**
- **Medicines**
- **Toiletries**
- **Telephone (hard-wired phones are best)**
- **Emergency-contact phone list**
- **Extra eyeglasses or contact lenses**
- **Baby formula**
- **Pet food**
- **Plastic sheeting**
- **Duct tape**

*** More extensive emergency supply checklists can be found in appendices F and G (see pp. 241–244).**

CHEMICAL AGENT BREAKDOWN*

BLISTER AGENTS	BLOOD AGENTS	CHOKING AGENTS	NERVE AGENTS
Mustard agents: Distilled mustard (HD), Mustard gas (H) (sulfur mustard), Mustard/lewisite (HL), Mustard/T, Nitrogen mustard (HN-1, HN-2, HN-3), Sesqui mustard, Sulfur mustard (H) (mustard gas) **Lewisites/chloroarsine agents:** Lewisite (L, L-1, L-2, L-3), Mustard/lewisite (HL), Phosgene oxime (CX)	Arsine (SA) **Cyanide agents:** Cyanogen chloride (CK), Hydrogen cyanide (AC), Potassium cyanide (KCN), Sodium cyanide (NaCN)	Ammonia (NH-3) Chlorine (CL) Hydrogen chloride (HCl) **Phosgene agents:** Diphosgene (DP), Phosphine, Phosphorus (elemental, white, or yellow)	**G agents:** Sarin (GB), Soman (GD), Tabun (GA) **V agents:** VX

* This list is not all inclusive. For information on additional chemicals, see http://www.bt.cdc.gov.

BLISTER AGENTS

OVERVIEW

This family of chemical agents is also called vesicant agents:

- **Mustards (e.g., sulfur mustard)**
- **Lewisites/chloroarsine agents**
- **Phosgene oxime**

Mustards and lewisites cause blistering on the skin after exposure. Mustard gas is the best-known example. A lesser-known but possible threat is lewisite.

MUSTARD GAS

Basic Facts

- Mustard agent, in some forms, can be a colorless, oily, odorless liquid.
- Mustard agent can be vaporized to form a gas, if heated.
- In some quantities, this agent may have a slight garlic odor and a yellowish-to-brownish tint.

Mustard Gas as a Weapon

- The agent may be persistent in the soil for weeks but generally only remains on materials after release for days to hours. This is highly dependent on the air temperature and purity of the compound.
- It can still be harmful if it settles in the ground.
- It was introduced as a weapon in World War I.

Mustard Gas Illness

- The agent enters the body through inhalation or contact with skin or eyes.
- The agent can cause skin damage on contact, especially on hot, humid days or in tropical climates.
- Signs and symptoms may not occur immediately. Depending on the severity of the exposure, symptoms may not occur for 2–24 hours.
- Symptoms include:
  - Skin burns, in which blisters surface within a few days; blisters become large and may be yellowish-brown in color
  - Eyes burning and swelling, which can cause blindness (lasting up to 10 days)
  - If gas is inhaled, may result in coughing, bronchitis, long-term respiratory disease, and cancer in the airways and lungs later in life

Mustard Gas Diagnosis and Treatment

- No effective medical test exists.
- Urine tests can be inconclusive.
- No specific antidote or treatment exists.
- Supportive medical care is given to the victim to minimize the effects of exposure.

Lessening the Impact of Mustard Gas Exposure

- Move away from the site of exposure immediately and go to higher ground for fresh air.
- Remove outer layer of clothing, place in a plastic bag, and seal as soon as possible.
- Immediately wash body thoroughly with soap and water.
- Flush irritated eyes with plain water for 10–15 minutes.
- Blisters should be treated as burns.
- If mustard agents have been swallowed, do not induce vomiting. Give milk to drink.
- Seek medical attention immediately.

LEWISITE

Basic Facts

- Lewisite is also known as L.
- This agent is a chemical warfare agent that causes immediate blistering of the skin and damage to the respiratory system.
- Lewisite is an oily liquid that can be colorless or can appear amber to black.
- This agent smells like geraniums and could be confused with the smell of ammonia.
- Lewisite contains arsenic.

- Lewisite is not found naturally in the environment; when released there, however, it can last for days.

Lewisite as a Weapon

- Lewisite was developed for use in World War I by the United States but was produced too late to be used.
- Lewisite has no other uses except as a chemical warfare agent.
- In a vapor state, lewisite can be released into the air.
- The liquid form of lewisite could possibly be used to poison water or food.
- People are exposed to lewisite by breathing in or ingesting it, or if it comes into contact with their skin or eyes.

Lewisite Illness

- Lewisite causes immediate damage to the skin, eyes, and respiratory (breathing) tract.
- In addition to its irritative effects, the effects of lewisite exposure are similar to those of arsenic poisoning, including stomach ailments and low blood pressure.
- Lewisite causes the following symptoms (all health information was gathered from animal studies, since there are no known cases of human exposure):

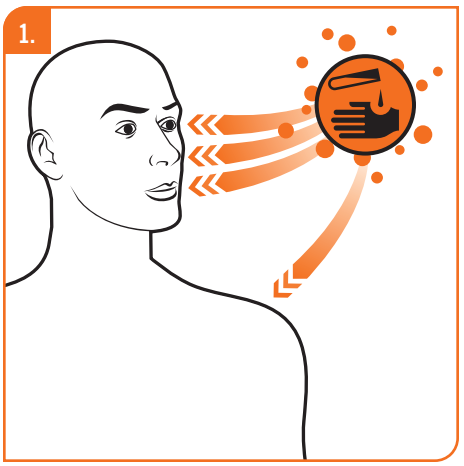
Seconds to minutes:

- Skin pain and irritation
- Immediate eye irritation, pain, swelling, and tearing
- Runny nose, sneezing, hoarseness, bloody nose, sinus pain, shortness of breath, and cough

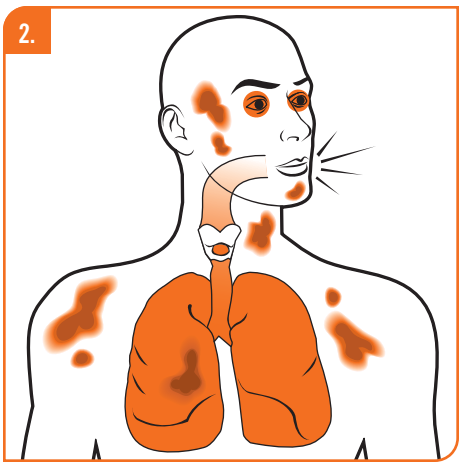
15–30 minutes:

- Skin redness

FIGURE 4–1: BLISTER AGENTS



Blister agent inhaled or absorbed through skin or eyes.



Symptoms include blisters or burns on skin or lungs, eye irratation, coughing, and respiratory irritation.

Within hours:

- Blisters
- Diarrhea, nausea, and vomiting
- Low blood pressure or "lewisite shock"

Within days:

- Blisters form lesions

Within weeks:

- Discoloration of the skin

- Lewisite may cause the following long-term health effects after prolonged exposure or in the case of exposure to high doses:
  - Skin burning
  - Chronic respiratory disease
  - Permanent blindness

Lewisite Diagnosis and Treatment

- The smell of lewisite may signal a release.
- Diagnosis is confirmed from people's symptoms.
- British-Anti-Lewisite is the preferred antidote and is most effective if given immediately after exposure.

Lessening the Impact of Lewisite Exposure

- Move away from the site of exposure immediately and go to higher ground for fresh air.
- Remove outer layer of clothing, place in a plastic bag, and seal as soon as possible.
- Immediately wash body thoroughly with soap and water.
- Flush irritated eyes with plain water for 10–15 minutes.
- If lewisite has been swallowed, do not induce vomiting or drink fluids.
- Seek medical attention immediately.

BLOOD AGENTS

OVERVIEW

Blood agents include:

- **Arsine**
- **Cyanide**

These agents deprive the blood and organs of oxygen.

ARSINE

Basic Facts

- Arsine is a colorless toxic gas.
- Arsine has a mild garlic odor that can be detected only at levels greater than those necessary to cause poisoning.
- Accidental formation of arsine in the workplace is the most common route of exposure.

Arsine as a Weapon

- Arsine was explored for chemical warfare in World War II by the British but was never used.
- Arsine is relatively easy to create for a deliberate release into the air because it is most commonly used in the semiconductor and metals refining industries and is readily available.

Arsine Illness

- The severity of arsine poisoning depends on the amount and duration of exposure.
- Arsine enters the bloodstream and damages red blood cells.
- Exposure to low or moderate doses of arsine causes symptoms within 2–24 hours, including:
  - Weakness
  - Fatigue
  - Headache
  - Drowsiness
  - Confusion
  - Shortness of breath
  - Rapid breathing
  - Nausea, vomiting, and/or abdominal pain
  - Red or dark urine
  - Yellow skin and eyes (jaundice)
  - Muscle cramps
- Exposure to high doses of arsine can cause:
  - Loss of consciousness
  - Convulsions
  - Paralysis
  - Respiratory failure possibly leading to death
- Long-term side effects of exposure include:
  - Kidney damage
  - Numbness and pain in the extremities
  - Memory loss or confusion

Arsine Diagnosis and Treatment

- A release is confirmed when people start exhibiting symptoms.
- Only during a large release will arsine's garlic odor be prevalent.
- There is no antidote for arsine poisoning.

Lessening the Impact of Arsine Exposure

- Move away from the site of exposure and get fresh air immediately.
- Remove outer layer of clothing, place in a plastic bag, and seal as soon as possible.
- Immediately wash body thoroughly with soap and water.
- Flush irritated eyes with plain water for 10–15 minutes.
- Seek medical attention immediately.

CYANIDE

Basic Facts

- Cyanide can come in many different forms, however, the following four types are more likely to be seen:
  - Hydrogen cyanide
  - Cyanogen chloride
  - Potassium cyanide
  - Sodium cyanide
- Legitimate uses of cyanide compounds include manufacturing applications, such as metal refining and photography.
- In gas form, the agent is colorless and may have a slight almond odor.

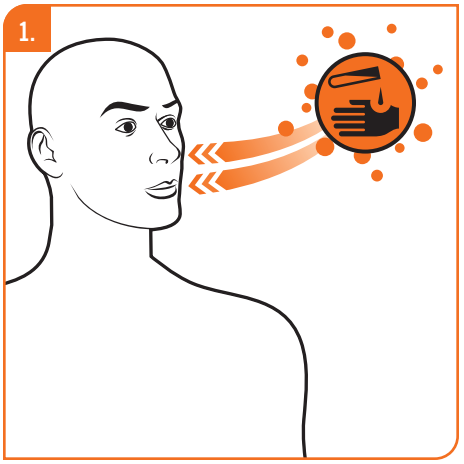
Cyanide as a Weapon

- The agent can be released into the air, soil, drinking water, or food supply.
- Cyanide is fast acting.
- Breathing in and ingesting cyanide are the most harmful routes of exposure.
- Cyanide is most dangerous in enclosed spaces.
- Cyanide evaporates quickly in open areas.
- Cyanide is relatively easy to obtain and release.

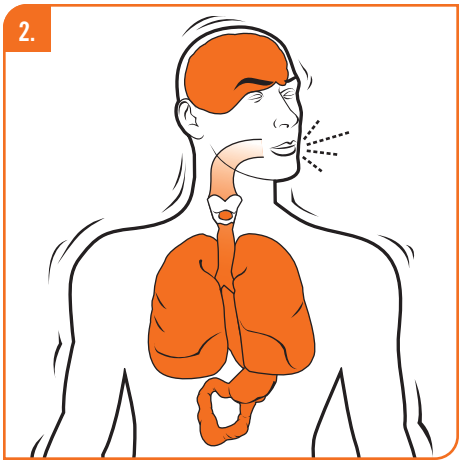
Cyanide Illness

- Cyanide deprives the body's cells from using oxygen.
- The agent is most harmful to the heart and brain, which rely heavily on oxygen.

FIGURE 4–2: BLOOD AGENTS



Blood agent inhaled or ingested.



Chemical deprives cells and tissues of oxygen causing rapid breathing, nausea, convulsions, and loss of consciousness.

- Symptoms include:
  - Rapid breathing, restlessness, dizziness, weakness, and headache
  - Nausea, vomiting, and convulsions
  - Loss of consciousness, injury to the lungs, and respiratory failure
  - Permanent heart and brain damage
  - Rapid progression to coma and death

Cyanide Diagnosis and Treatment

- Environmental testing can confirm a release.
- Blood tests can confirm individual exposure.
- Immediate medical attention is recommended.
- Preferred antidotes are a nitrite or a thiosulfate compound.

Lessening the Impact of Cyanide Exposure

- Move away from the site of exposure and get fresh air immediately.
- Remove outer layer of clothing, place in a plastic bag, and seal as soon as possible.
- Immediately wash body thoroughly with soap and water.
- Flush irritated eyes with plain water for 10–15 minutes.
- Seek medical attention immediately.

CHOKING AGENTS

OVERVIEW

Choking agents include:

- **Ammonia**
- **Chlorine**
- **Hydrogen chloride**
- **Phosgene**
- **Phosphine**
- **Phosphorus (certain forms)**

These agents attack the respiratory system, making it difficult to breathe.

CHLORINE

Basic Facts

- Chlorine is used in industry and is found in bleach and other common household products.
- Chlorine can take a gas or yellow-green liquid form.
- Chlorine emits a strong odor, which is like the odor of bleach, and can become explosive and flammable when mixed with other chemicals.

Chlorine as a Weapon

- Chlorine is most likely to be released as a gas.
- It can be released into the air and spreads rapidly.
- Chlorine settles close to the ground.
- In liquid form, it can be released into the water or food supply.
- Chlorine was used in World War II as a chemical weapon.
- Terrorists may attempt to access large quantities stored at water treatment facilities, swimming pool complexes, and industrial sites.

Chlorine Illness

Symptoms of exposure include:

- Coughing and tightness in the chest
- Burning eyes, nose, and throat
- Blurred vision, nausea, and vomiting
- Blistered skin
- Shortness of breath and fluid in the lungs
- Long-term complications, including pneumonia and chronic bronchitis

Chlorine Diagnosis and Treatment

- Air sampling is conducted to confirm a release.
- No antidote exists.
- Supplemental oxygen should be given as needed.
- Immediate medical treatment is essential.

Lessening the Impact of Chlorine Exposure

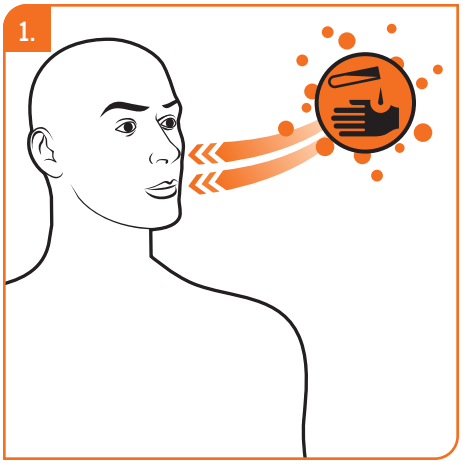
- Move away from the site of exposure immediately and move to higher ground for fresh air.
- Remove outer layer of clothing, place in a plastic bag, and seal as soon as possible.
- Immediately wash body thoroughly with soap and water.
- Flush irritated eyes with plain water for 10–15 minutes.
- If you have ingested chlorine, do not induce vomiting or drink fluids.
- Seek medical attention immediately.

PHOSGENE

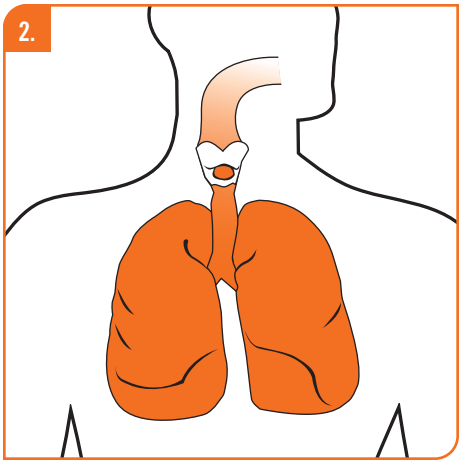
Basic Facts

- Phosgene is also known as CG.
- Phosgene is an industrial chemical used to make plastics and pesticides.
- Phosgene is a poisonous gas at room temperature.
- When cooled, phosgene is converted into liquid form.

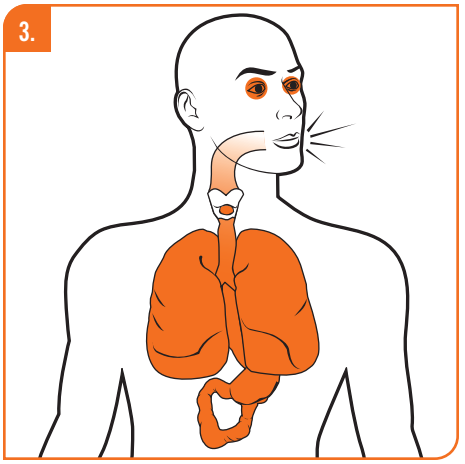
FIGURE 4–3: CHOKING AGENTS



Choking agent inhaled.



Chemical attacks respiratory system.



Symptoms include coughing, burning eyes or throat, nausea, fluid in lungs, and difficulty breathing.

- In a liquid release or spill, phosgene changes to gas and stays close to the ground.
- Phosgene may appear colorless, or as a white or pale yellow cloud.
- In low concentrations, phosgene smells like newly mown hay.
- In high doses, phosgene has a strong unpleasant odor.
- Phosgene can cause flammable substances to burn but is not flammable itself.
- Phosgene is not found naturally in the environment.
- Phosgene may be relatively easy to obtain since it is used in industry.

Phosgene as a Weapon

- Phosgene was used extensively during World War I, by both German and Allied armies, causing many deaths.
- Phosgene could be released into the air.
- Phosgene liquid could be released into water to expose those who drink it or touch it.
- Phosgene could be used in liquid form to poison food.

Phosgene Illness

- In gas or liquid form, phosgene can damage the skin, eyes, nose, throat, and lungs.
- Proximity to a release and the length of exposure determine how serious the phosgene illness is.
- Symptoms may occur immediately after exposure if doses are extremely high. These include:
  - Coughing
  - Burning sensation in the throat and eyes
  - Watery eyes
  - Blurred vision
  - Difficulty breathing or shortness of breath
  - Nausea and vomiting
  - With skin contact, possible development of lesions similar to those from frostbite or burns
  - Within 2–6 hours after exposure to high doses of phosgene, possible development of fluid in the lungs (pulmonary edema)
- Exposure to low or moderate concentrations of phosgene may have few early clinical findings. Development of worsening signs and symptoms may occur 12–24 hours after the initial exposure. Delayed symptoms may surface up to 48 hours after exposure. These include:
  - Difficulty breathing
  - Coughing up white- to pink-tinged fluid and developing fluid in the lungs (pulmonary edema)

- Low blood pressure
- Heart failure
- Severe respiratory distress

Phosgene Diagnosis and Treatment

- There is no known antidote.
- Quickly moving away from the source of exposure is most important.
- Supplemental oxygen should be given as needed.
- People should be monitored for up to 48 hours for delayed symptoms.
- Most people exposed recover, but high doses can result in chronic bronchitis and emphysema.

Lessening the Impact of Phosgene Exposure

- Move away from the site of exposure immediately and move to higher ground for fresh air.
- Remove outer layer of clothing, place in a plastic bag, and seal as soon as possible.
- Immediately wash body thoroughly with soap and water.
- Flush irritated eyes with plain water for 10–15 minutes.
- If you have ingested phosgene, do not induce vomiting or drink fluids.
- Seek medical attention immediately.

A REAL-LIFE EXAMPLE OF HOW STATE, LOCAL, AND FEDERAL AGENCIES COLLABORATED ON AN ACCIDENTAL CHEMICAL RELEASE IN THE UNITED STATES: GRANITEVILLE, SOUTH CAROLINA

Although this case study only provides a snapshot of a highly complex event, it does provide some insight for what the response to a chemical release may look like and how health officials at the local, state, and federal levels work together and with many other agencies to respond to such an event.

At approximately 2:40 a.m. on January 6, 2005, two freight trains collided in Graniteville, South Carolina, releasing an estimated 11,500 gallons of chlorine gas, which caused nine deaths and sent at least 529 persons seeking medical treatment for possible chlorine exposure. Because of the potential for death and injury, local emergency management officials initially issued a shelter-in-place order for a 1-mile radius around the site. At noon, South Carolina declared a state of emergency and local officials issued a mandatory evacuation for over 5,000 residents within this 1-mile radius. Area schools and businesses were closed.

Hazardous materials teams worked together to contain the chlorine exposure and remove it from the site—including personnel from the local fire departments, the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy's Savannah River Site Fire Department, and state response teams. Meanwhile, federal responders from the CDC, EPA, and the U.S. Coast Guard arrived to assist local and state officials in sampling air in factories, homes, and schools within the 1-mile radius. Additional free inspections were offered to residents and business owners with continued concerns.

Local law enforcement personnel enforced a curfew and the mandatory evacuation. Local, state, and federal agencies assisted in perimeter security, investigations, and coordination. The Federal Bureau of Investigation, National Transportation Safety Board, and the Federal Railroad Administration conducted investigations into the train derailment.

Starting January 13, residents were allowed to return to their homes gradually as air quality was deemed safe, depending on where their homes were located in relation to the release. Residents were also provided with HHS guidance about what to do when returning home (e.g., what to do with existing food and medicine, what to do about pets that were left in the evacuation area).

A rapid epidemiological assessment indicated that out of 511 persons examined in emergency rooms after the exposure, 69 were hospitalized in seven area hospitals. An ongoing assessment began to examine the public health impact associated with exposure to chlorine gas. Those exposed were interviewed about their symptoms, the location and duration of their exposures, and demographic information needed to monitor long-term health effects.

Sources:

Centers for Disease Control and Prevention. (2005). Public health consequences from hazardous substances acutely released during rail transit—South Carolina, 2005; selected states, 1999–2004. Morbidity and Mortality Weekly Report, 54(3), 64–67. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5403a2.htm.

U.S. Environmental Protection Agency. (2005). Norfolk Southern Graniteville derailment. http://www.epa.gov/Region4/graniteville/index.htm.

NERVE AGENTS

OVERVIEW

Nerve agents do damage by affecting the nervous system of victims. These agents are of the greatest concern because of the low amounts needed to produce significant symptoms and even death. These agents include:

- **Sarin**
- **Soman**
- **Tabun**
- **VX**

SARIN

Basic Facts

- Sarin is a manufactured compound that is colorless, odorless, and tasteless.
- Sarin can take a gas or liquid form and is highly volatile and lethal.
- Sarin is absorbed through the skin or respiratory tract and causes severe respiratory damage.
- Even very small amounts can kill people.
- Vaporized sarin stays near the ground.
- Sarin remains deadly in warm, dry temperatures but can degrade in humidity.

Sarin as a Weapon

- Sarin can be released into the air and expose people through ingestion or contact with the skin or eyes.
- Sarin can be released into water and expose people who touch or drink the contaminated water.
- Sarin can be used to contaminate food.
- Sarin is most dangerous in enclosed spaces.
- Victims need only be exposed to a small amount to become ill.
- Sarin was used by Aum Shinrikyo, a Japanese cult, in a 1995 Tokyo subway attack, which demonstrated to the world that it could be used as a terrorist weapon.

Sarin Illness

Symptoms include:

- Difficulty breathing, tightness in chest, and respiratory arrest
- Nausea, drowsiness, vomiting, and diarrhea
- Confusion and seizures
- Drooling, runny nose, eye irritation, and tearing
- Severe muscle weakness

Sarin Diagnosis and Treatment

- With large doses, death can occur within seconds to minutes after exposure.
- Rapid recognition after a suspected attack is the key to successful treatment.
- Atropine and pralidoxime are the preferred antidotes but must be used quickly to be effective.
- Oxygen should be administered to those having difficulty breathing.

Lessening the Impact of Sarin Exposure

- Move away from the site of exposure immediately and move to higher ground for fresh air.
- Remove outer layer of clothing, place in a plastic bag, and seal as soon as possible.
- Immediately wash body thoroughly with soap and water.
- Flush irritated eyes with plain water for 10–15 minutes.
- If you have ingested sarin, do not induce vomiting or drink fluids.
- Seek medical attention immediately.

SOMAN

Basic Facts

- Soman is also known as GD.
- Soman is a clear, colorless, tasteless liquid that can smell fruity or like oil of camphor.
- Soman can be heated into a vapor form.
- Soman is not found naturally in the environment.

Soman as a Weapon

- Soman is a human-made chemical warfare agent.
- Germany developed soman as an insecticide in 1944.
- Soman is suspected of being used during the Iran-Iraq war in the 1980s.
- Soman can be released into the air in vapor form.
- Soman could be used in liquid form to poison water or food.

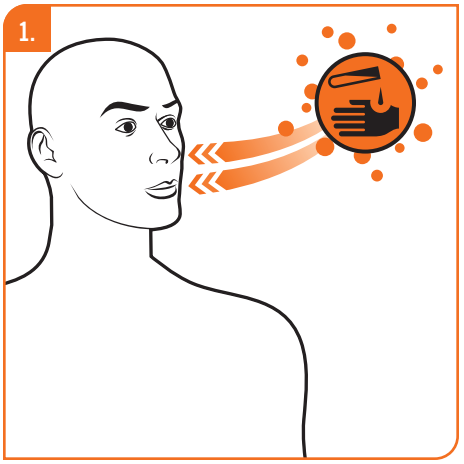
Soman Illness

- People can get sick after inhaling soman or by absorbing it through skin or eye contact.
- People can get sick by drinking poisoned water or swimming in contaminated water.
- Illness can follow eating food contaminated with soman.
- Symptoms will appear within a few seconds after exposure to the vapor form of soman.
- In liquid form, soman produces symptoms within a few minutes or up to 18 hours after exposure.
- Even a tiny drop of the nerve agent on the skin can cause sweating and muscle twitching at the site of contact.
- Low or moderate doses of soman cause the following symptoms:
  - Runny nose
  - Watery eyes
  - Small, pinpoint pupils
  - Eye pain
  - Blurred vision
  - Drooling and excessive sweating
  - Cough
  - Chest tightness
  - Rapid breathing
  - Diarrhea
  - Increased urination
  - Confusion
  - Drowsiness
  - Weakness
  - Headache
  - Nausea, vomiting, and/or abdominal pain
  - Slow or fast heart rate
  - Abnormally low or high blood pressure
- Exposure to a large dose of soman, by any route, may result in these additional health effects:
  - Loss of consciousness
  - Convulsions
  - Paralysis
  - Respiratory failure, possibly leading to death
- Vapors can be trapped on a person's clothing and can expose others.

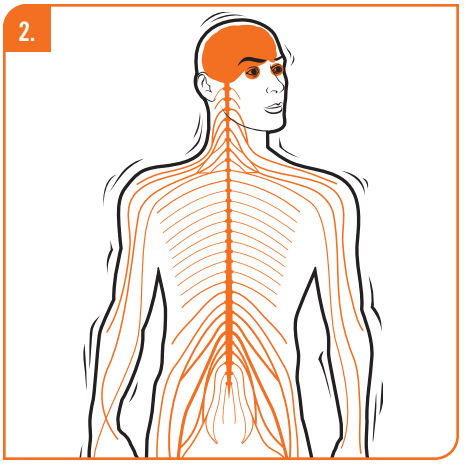
Soman Diagnosis and Treatment

- The odor of soman may be a signal of a release.
- Treatment of soman poisoning with antidotes (atropine and pralidoxime) is recommended as soon as possible (ideally within minutes).
- Long-term supportive health care may be necessary.
- Mild or moderately poisoned people who are treated both rapidly and adequately usually recover completely.
- Severely exposed people or those victims who are ineffectively treated may not survive.

FIGURE 4–4: NERVE AGENTS



Nerve agent inhaled.



Chemical affects the nervous system creating seizures, eye irritation, and muscle weakness.

Lessening the Impact of Soman Exposure

- Move away from the site of exposure immediately and move to higher ground for fresh air.
- Remove outer layer of clothing, place in a plastic bag, and seal as soon as possible.
- Immediately wash body thoroughly with soap and water.
- Flush irritated eyes with plain water for 10–15 minutes.
- If you have ingested soman, do not induce vomiting or drink fluids.
- Seek medical attention immediately.

TABUN

Basic Facts

- Tabun is also known as GA.
- Tabun is a clear, colorless, tasteless liquid with a faint fruity odor.
- Tabun can become a vapor, if heated.
- Tabun is not found naturally in the environment.
- Tabun is toxic and affects the body rapidly.

Tabun as a Weapon

- Tabun is human-made for chemical warfare.
- Tabun was originally developed by Germany in 1936 as a pesticide.
- Tabun was possibly used in the 1980s during the Iran-Iraq war.
- Tabun could be released through the air.
- Tabun could be used to poison water.
- Tabun could be used to contaminate food.

Tabun Illness

- People can become ill after breathing in tabun, ingesting it, or through contact with skin or eyes.
- People can get sick by eating food contaminated with tabun, by drinking contaminated water, or by coming into contact with contaminated water.
- After exposure to tabun in vapor form, symptoms should appear within a few seconds.
- Exposure to tabun in liquid form produces symptoms within a few minutes or up to 18 hours later.
- Tabun can remain active on a person's clothing, leading to exposure of others.
- A tiny drop of this nerve agent on the skin can cause sweating and muscle twitching at the site of contact.
- People exposed to a low or moderate dose of tabun may experience some or all of the following symptoms within seconds to hours after exposure:
  - Runny nose
  - Watery eyes
  - Small, pinpoint pupils
  - Eye pain
  - Blurred vision
  - Drooling and excessive sweating
  - Cough
  - Chest tightness
  - Rapid breathing
  - Diarrhea
  - Increased urination
  - Confusion
  - Drowsiness
  - Weakness
  - Headache
  - Nausea, vomiting, and/or abdominal pain
  - Slow or fast heart rate
  - Abnormally low or high blood pressure
- Exposure to a large dose of tabun may result in:
  - Loss of consciousness
  - Convulsions
  - Paralysis
  - Respiratory failure, possibly leading to death

Tabun Diagnosis and Treatment

- The fruity odor of tabun may provide warning of a release.
- Atropine and pralidoxime are antidotes which can be given for poisoning. They should be administered ideally as soon as possible.
- Other supportive care in a hospital setting should be given as needed (such as oxygen, assistance with breathing, etc.).
- A complete recovery is likely for those with mild or moderate poisoning who are treated both rapidly and adequately.
- Those who inhale or are contaminated with large amounts of tabun or those who are ineffectively treated can die.
- Repeated exposure to tabun can result in long-term damage to the body.

Lessening the Impact of Tabun Exposure

- Move away from the site of exposure immediately and move to higher ground for fresh air.
- Remove outer layer of clothing, place in a plastic bag, and seal as soon as possible.
- Immediately wash body thoroughly with soap and water.
- Flush irritated eyes with plain water for 10–15 minutes.
- If you have ingested tabun, do not induce vomiting or drink fluids.
- Seek medical attention immediately.

VX

Basic Facts

- VX can be heated to create a vapor form, but only in small amounts.
- The agent is stable in the environment.
- In average weather, VX can last on objects for days.
- In extremely cold weather, VX can sustain its potency for months.
- VX can be a long-term hazard on surfaces.
- VX is considered more toxic than other nerve agents.

VX as a Weapon

- VX is a human-made chemical warfare agent.
- The agent was originally developed in the United Kingdom in the early 1950s.
- VX may have been used in the Iran-Iraq war in the 1980s.
- VX is primarily used in liquid form to contaminate water or food.

VX Illness

- People are exposed to VX by ingesting it, breathing in a VX mist, or by coming into contact with it through skin or eyes.
- The vapor form of VX can produce symptoms within seconds after exposure.
- In liquid form, VX produces symptoms within a few minutes or up to 18 hours after exposure.
- Unless washed off immediately, VX liquid on the skin can be lethal.
- Even a tiny drop of nerve agent on the skin can cause sweating and muscle twitching at the site of contact.
- VX remains potent on a person's clothing, meaning that others can be exposed.
- Within seconds or hours of moderate exposure to VX, symptoms include:
  - Runny nose
  - Watery eyes
  - Small, pinpoint pupils
  - Eye pain
  - Blurred vision
  - Drooling and excessive sweating
  - Cough
  - Chest tightness
  - Rapid breathing
  - Diarrhea
  - Increased urination
  - Confusion
  - Drowsiness

- Weakness
- Headache
- Nausea, vomiting, and/or abdominal pain
- Slow or fast heart rate
- Abnormally low or high blood pressure

› Exposure to a large dose of VX may cause:

- Loss of consciousness
- Convulsions
- Paralysis
- Respiratory failure possibly leading to death

VX Diagnosis and Treatment

› A release may not be easy to detect because VX has no odor.

› A release is confirmed by the symptoms of those exposed.

› Atropine is the preferred antidote and must be given quickly after exposure.

› People can recover completely from mild or moderate poisoning that is both rapidly and effectively treated.

› Those exposed to large doses of VX or those people ineffectively treated may not survive.

› Prolonged exposure (e.g., in a war setting) can result in long-term damage to the body.

Lessening the Impact of VX Exposure

› Move away from the site of exposure immediately and move to higher ground for fresh air.

› Remove outer layer of clothing, place in a plastic bag, and seal as soon as possible.

› Immediately wash body thoroughly with soap and water.

› Flush irritated eyes with plain water for 10–15 minutes.

› If you have ingested VX, do not induce vomiting or drink fluids.

› Seek medical attention immediately.

› Rescue personnel should wear the highest level of protection in a release area until testing can be completed and the safety of lower levels of protection is confirmed.

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RADIATION EMERGENCIES

5

RADIATION EMERGENCIES

GOAL OF THIS SECTION

- To provide information on nuclear events (e.g., nuclear bomb, improvised nuclear devise)
- To provide information on radiological events (e.g., radiological dispersal device, such as a dirty bomb; sabotage of a nuclear power plant)

WHAT THIS SECTION INCLUDES

- Explanation of the differences between nuclear and radiological events and how they might affect people
- Sources for additional information
- How to lessen the impact of radiation exposure

WHAT THIS SECTION DOES NOT INCLUDE AND WHY

- Extensive detail on radiological emergencies is not provided in this section due to the complexity of the topic.
- Radiological accidents are not covered in detail in this section. However, much of the material in this section would be applicable to radiological accidents (e.g., nuclear reactor issues, a spill of radiological materials, accidents with nuclear weapons).

BASIC FACTS

- **Radiation** is energy moving in the form of particles or waves. Some examples of electromagnetic radiation are heat, light, radio waves, and microwaves. The specific type of radiation discussed in this guide is ionizing radiation.
- **Ionizing radiation** is a very high-energy form of electromagnetic radiation and cannot be detected without specialized equipment.
- **Radioactivity** is the process of spontaneous transformation of the nucleus of an atom, generally with the emission of alpha or beta particles often accompanied by gamma rays. This process is referred to as decay or disintegration of an atom.
  - An **alpha particle** is the nucleus of a helium atom, made up of two neutrons and two protons. Alpha particles generally carry more energy than gamma or beta particles and deposit that energy very quickly while passing through human body tissue. Alpha particles can be stopped by a thin layer of light material, such as a sheet of paper, and cannot penetrate the outer, dead layer of skin. Therefore, they do not damage living tissue when outside the body. When alpha-emitting atoms are inhaled or swallowed, however, they are especially damaging because they transfer relatively large amounts of ionizing energy to living cells.
  - **Beta particles** are electrons ejected from the nucleus of a decaying atom. Although they can be stopped by a thin sheet of aluminum, beta particles can penetrate the dead skin layer, potentially causing burns. They can pose a serious direct or external radiation threat and can be lethal depending on the amount received. They also pose a serious internal radiation threat if beta-emitting atoms are ingested or inhaled.
  - **Gamma rays** are a high-energy electromagnetic radiation. Gamma rays are very penetrating and generally require material such as lead or thick concrete to reduce the exposure. Gamma rays are a serious direct or external radiation threat. They also pose a threat when they are inhaled or ingested. Gamma rays are very similar to X-rays.
  - **Neutrons** are small atomic particles found within an atom's nucleus. Neutrons are a highly penetrating radiation when released by nuclear fission (the splitting of an atom) and are a serious direct or external radiation threat after a nuclear detonation (e.g., nuclear weapon or an improvised nuclear device). These types of radiation incidents are discussed later in this section.

Any or all of the types of radiation described above may be present after a radiological event. Public health officials would determine the specific protective actions that the public should take as soon as the nature of the event is determined by radiological experts.

- **Radioactive material** is material that contains unstable (radioactive) atoms that give off radiation as they decay.
- **Radioactive decay** is the spontaneous disintegration of the nucleus of an atom.
- **Radioactive half-life** is the time required for a quantity of a radioactive material to decay by half.
- **Radioactive contamination** is the deposition of radioactive material (e.g., dirt, dust, debris, liquid) on the surfaces of structures, areas, objects, or people. It can be airborne, external, or internal.
- **Radiation exposure** is not the same as contamination. Exposure occurs when radiation penetrates the body and deposits its energy. For example, when a person has a chest X-ray, he or she is *exposed* to radiation, but he or she is not *contaminated*.

NUCLEAR/RADIOLOGICAL AGENTS— TIMELINE OF SELECTED IMPORTANT EVENTS

1940: Scientists based in Britain first report that the production of a nuclear bomb is possible.

1941: British nuclear weapons research begins.

1943: Americans join the research effort with the "Manhattan Project."

1945: The United States uses two atomic bombs against Japan in World War II.

1957: First full-scale nuclear power plant goes into service in Shippingport, PA.

1968: Treaty on the Non-Proliferation of Nuclear Weapons is developed.

1979: Three Mile Island nuclear power plant near Harrisburg, PA, releases small amounts of radioactive gases into the atmosphere after the power plant's core accidentally overheats and partially melts. There were no deaths or injuries to plant workers or members of the nearby community from this accident.

1986: An accidental chain reaction in the Soviet Union's Chernobyl nuclear power plant, near Kiev, leads to an explosion that releases radiation into the air. The accident kills more than 30 people immediately and prompts the evacuation of 135,000 people as a result of the high radiation levels in the surrounding 20-mile radius.

1987: Four people die of acute radiation sickness and others are sickened in Goiania, Brazil, after two individuals discover radioactive cesium in a canister scavenged from an abandoned hospital. Children inadvertently spread the radiation throughout the community after rubbing the canister's contents on their bodies so they could glow in the dark.

1999: An accident occurs at a nuclear fuel conversion plant in Tokaimura, Japan. The accident was caused by human error circumventing standard procedures. Three workers suffered from acute radiation syndrome (one subsequently died). Other workers and some members of the public were exposed to radiation. Families within the 350-meter perimeter of the site were evacuated and the population within the 10-kilometer radius (300,000 people) were sheltered-in-place for 18 hours.

NUCLEAR/RADIOLOGICAL AGENTS AS WEAPONS

The first step in understanding radiation emergencies is to draw the distinction between a **nuclear event** (like the bomb dropped on Hiroshima, Japan) and a **radiological event,** such as a nuclear power plant incident or a radiological dispersal device (e.g., dirty bomb). In short, a nuclear event involves nuclear fission (splitting of atoms) and a highly destructive explosion that instantly devastates people and buildings because of extreme heat and impact of the blast. A nuclear event typically leaves large amounts of radioactivity behind. On the other hand, a radiological event does not involve nuclear fission but may be accompanied by an explosion and release of radioactivity. A radiological event typically involves the release of less radioactivity than a nuclear event. With both nuclear and radiological events, wind direction and weather patterns can spread radioactivity beyond the immediate incident site.

Four specific radiation incidents will be discussed:

- Nuclear power plant attack
- Radiological dispersal device (e.g., dirty bomb)
- Improvised nuclear device (e.g., suitcase bomb)
- Nuclear weapon

NUCLEAR POWER PLANT ATTACK

- This is a radiological threat that does not involve a nuclear blast.
- Terrorists could attack a nuclear power plant by using explosives, hacking into the computer system, or crashing a plane into the reactor or other structures on site.
- Security measures are in place so that such attempts are likely to be detected early. Also, nuclear power plants have well-established emergency response procedures in place.
- Nuclear power plants are built to sustain extensive damage without releasing radioactive material.
- Theoretically, radioactive materials could escape in some cases and contaminate the surrounding area and the environment.
- Costly and time-consuming cleanup efforts could be required to remove released radioactive materials from the environment.
- Though the death toll and radiation exposure could be limited, the psychological impact could be severe. In the case of the limited meltdown accident at Pennsylvania's Three Mile Island in 1979, a governor's commission report showed that one of the main health effects of the accident was on the mental health status of people in the region.

RADIOLOGICAL DISPERSAL DEVICE (RDD)

- This is a radiological threat that does not involve a nuclear blast.
- Terrorists could obtain radioactive materials to use in such a device. Radioactive materials can come from a nuclear power plant, medical or research facility, or food-processing plant.
- Radioactive materials could be dispersed by using explosives (e.g., dirty bomb) or other means, such as aerosols or sprays.
- A dirty bomb involves conventional explosives laced with radioactive material, so that the blast would contaminate an area with radioactive particles.
- In the case of a dirty bomb, the resulting blast could kill people in the immediate area and spread contamination around an area the size of several city blocks.
- Though the death toll and radiation exposure would be limited, the psychological impact could be severe. In this vein, some have dubbed the dirty bomb a "weapon of mass *disruption*."
- Radiological material can also be covertly placed in areas where it could easily expose people to radiation. This hidden source is often referred to as a "silent" source or may be called a radiation-emitting device. This method of radiation release does not involve an explosion or dispersal of radioactive materials by any other means.

IMPROVISED NUCLEAR DEVICE (IND)

- This is a small nuclear weapon (see section below) capable of producing a nuclear blast.
- The physical size of these weapons can be small enough to fit in a suitcase (i.e., suitcase bomb).
- The design and destructive nature of an improvised nuclear device is comparable to the bomb dropped on Hiroshima, Japan, at the end of World War II.

NUCLEAR WEAPON

- A nuclear weapon produces a nuclear detonation involving the joining (fusion) or splitting (fission) of atoms to produce an intense pulse or wave of heat, light, air pressure, and radiation.
- Highly processed plutonium or uranium undergoes fission in a chain reaction blast.
- The blast is designed to cause catastrophic damage to people, buildings, and the environment.
- Highly guarded materials and technical expertise are required to produce these weapons.
- The extent of damage depends on the yield (power) of the bomb. The destructive nature of these weapons can be in the order of 100 times the bomb dropped on Hiroshima.
- When a nuclear weapon explodes, a large fireball is created. Everything inside of this fireball vaporizes, including soil and water, and is carried upwards. This creates the mushroom cloud that is associated with a nuclear blast, detonation, or explosion.

- Radioactive material from the nuclear device mixes with the vaporized material in the mushroom cloud. As this vaporized radioactive material cools, it becomes condensed and forms particles, such as dust. The condensed radioactive material then falls back to the earth; this is what is known as fallout.
- Because fallout is in the form of particles, it can be carried long distances on wind currents and end up miles from the site of the explosion.
- Fallout is radioactive and can cause contamination of anything on which it lands, including food and water supplies.

WHAT WE DO NOT KNOW ABOUT NUCLEAR/RADIOLOGICAL AGENTS AS WEAPONS

- Because there is a wide range of possible scenarios, it is difficult to predict beforehand how elevated radiation exposures will be, how extensive the radioactive contamination will be, or how much effort would be involved in cleanup and recovery.
- In the case of an attack on a nuclear power plant, it is unlikely that any radioactive materials would be released to the area outside the facility, but the possibility cannot be categorically ruled out.
- In the case of a dirty bomb, the overall impact will depend on many factors, such as specific radioactive material used in the bomb and wind and weather conditions at the time of the blast.
- The impact of other types of RDDs and silent sources also depends on a variety of factors, including size of the source and how early the device or source is detected.
- The overall impact of a nuclear blast depends on its size, whether there is fallout, how populated the target area is, and how much of the potential local response infrastructure is destroyed.

ASSESSING THE RISK

- The highly purified plutonium and uranium needed to make a nuclear weapon or suitcase bomb are **difficult to acquire.** Considerable engineering skill and expertise would be required to construct a nuclear device using plutonium; devices using uranium are technically easier to construct.
- Other radiological materials, such as cesium-137 or cobalt-60, that would be suitable for use in a RDD are **moderately available** since they can be found in research, medical, and food irradiation facilities.
- Certain radioactive materials can **persist for years** or even decades in the environment. The half-life of cesium-137, for example, is about 30 years. Other radioisotopes have much shorter half-lives (e.g., iodine-131 has a half-life of about 8 days).
- Though the construction of a nuclear weapon or suitcase bomb involves advanced scientific knowledge, terrorists would only have to be **moderately skilled** to construct a dirty bomb, which simply involves wrapping conventional explosives around radioactive materials.
- A nuclear blast would be **highly lethal,** potentially killing a very large number of victims, whereas the effects of an RDD attack would almost certainly be much less severe.

TABLE 1: EFFECTS OF DIFFERENT RADIATION EMERGENCIES

	NUCLEAR POWER PLANT ATTACK	RADIOLOGICAL DISPERSAL DEVICE (RDD)
Type of Event	Radiological	Radiological
Examples of Radiation Dispersal	Possible escape of radioactive material from attack on plant	• Conventional explosives laced with radioactive material (e.g., dirty bomb) • Aerosols or sprays
Nuclear Blast	No	No
Amount of Radiation Exposure	• Less than a nuclear event • Although unlikely, radioactive materials could escape/ contaminate the area and environment	• Limited • Dirty bomb blast could spread contamination around area the size of several city blocks
Consequences	• Death toll could be limited • Plants are built to sustain extensive damage without releasing radioactive material • Psychological impact could be severe	• Limited death toll • In the case of a dirty bomb, initial explosion could kill or injure people in the immediate area • Psychological impact could be severe

RADIATION-EMITTING DEVICE (RED)	IMPROVISED NUCLEAR DEVICE (IND)	NUCLEAR WEAPON
Radiological	Nuclear	Nuclear
Hiding radioactive material in a populated area	Smaller nuclear weapon (e.g., suitcase bomb)	Nuclear weapon developed for strategic military purposes
No	• Smaller nuclear explosion of varying size • Can be as large as the bomb dropped on Hiroshima	• Highly destructive nuclear explosion • Can be in the order of 100 times the bomb dropped on Hiroshima
• Limited • Depends on the size of the source and speed of detection	• Varying • May or may not include fallout	• Large • Radioactive particles from the fallout could be carried long distances
• Depends on the size of source, how early it is detected, and other factors • Psychological impact could be severe	• Depends on the size of the blast, whether there is fallout, and population of area • Psychological impact could be severe	• Catastrophic damage to people, buildings, and the environment • Psychological impact could be severe

INSTRUCTIONS TO SHELTER-IN-PLACE AND SEAL THE ROOM DUE TO RADIATION EMERGENCIES

If you have been exposed:

- **If coming from outside, remove outer layer of clothing and seal it in a plastic bag**
- **Shower and gently wash with soap, if possible**

To shelter-in-place and seal the room:

- **Find a room with as few windows and doors as possible**
- **Go to the *lowest* level possible**
- **Turn off the air conditioner, heater, and fans**
- **Close the fireplace damper**
- **Fill sinks and tubs with water**
- **Turn on the radio for instructions**
- **Keep a telephone handy**
- **If emergency officials instruct you to seal the room, tape plastic over windows and doors; seal with duct tape. Tape over vents and electrical outlets (and any other openings).***

*** Within a few hours, the plastic and tape may need to be removed to allow fresh air to enter the room to prevent suffocation. *Follow the instructions of emergency workers and/or public health officials.***

LESSENING THE IMPACT OF EXPOSURE (to Radiological Agents, in General)

- Follow the instructions of emergency workers, if possible.
- The most important concepts to minimize exposure are time, distance, and shielding.
  - Time: Decrease the amount of time spent near the radiation source.
  - Distance: Increase your distance from the radiation source.
  - Shielding: Increase the shielding between you and the radiation source. Shielding is anything that creates a barrier between people and the radiation source.
- Stay indoors and "shelter-in-place" to reduce exposure. Being inside a building (particularly basement), inside a vehicle, or behind a wall would provide some protection.
- Close doors and windows and shut off ventilation systems using outside air.
- If outdoors, cover mouth and nose with a scarf, handkerchief, or other type of cloth to avoid inhaling radioactive dust.
- If near the site of an attack and dust or debris is on one's body or clothing, decontaminate (remove outer layer of clothing and bag it, shower without harsh scrubbing, and wash hair) before leaving to avoid spreading contamination.
- Treatment of life-threatening injuries should not be delayed in order to perform decontamination. Seek medical attention if injured by the explosion.
- Do not eat potentially contaminated foods or drink potentially contaminated water.
- Federal agencies have developed real-time models to predict how a nuclear or radiological attack would affect a given area. This information can be used to quicken response efforts and limit the number of people affected by an attack.

THE IMPACT OF RADIATION EMERGENCIES

A nuclear or radiological event could have a wide range of impacts, including immediate or long-term health effects, psychological impacts, environmental contamination, and economic consequences. The magnitudes of these impacts are highly dependent on specific circumstances of the incident.

RADIATION INJURIES

- Radiation injuries could result from the aftermath of a nuclear blast and are less likely following a radiological incident.
- Health effects may not be apparent for months or even years after exposure to radiation.
- The type and extent of injury may depend on:
  - The amount (dose) of radiation to which a person is exposed
  - The type of radiation (alpha, beta, gamma) to which a person is exposed
  - Whether a person is exposed to radiation externally (e.g., skin) versus internally (e.g., inhaled)

- If someone is contaminated with radioactive materials externally (e.g., on his or her clothing), exposure may be reduced by decontamination (e.g., removing outer layer of clothing and showering).
- Internal contamination occurs if someone ingests or inhales radioactive materials and the materials are incorporated by the body. Medications may help reduce the amount of radioactive materials in the body.
- A person may be exposed to radiation without being contaminated with radioactive materials. For example, after a nuclear detonation, penetrating radiation may expose a person to radiation (similar to receiving an X-ray) without necessarily contaminating the person with radioactive materials. More information on the distinction between exposure and contamination (internal and external) can be found at http://www.bt.cdc.gov/radiation/contamination.asp.
- If the radiation dose is large enough, victims can develop what is called acute radiation syndrome or radiation sickness. Symptoms, not all of which develop at the same time, include nausea, vomiting, diarrhea, fever, loss of appetite, skin damage (e.g., redness, itching, swelling, blisters), seizures, and coma. These symptoms are non-specific and may be indistinguishable from those of other injuries or illness. More information on acute radiation syndrome can be found at http://www.bt.cdc.gov/radiation/ars.asp.
- If the radiation dose is small, no immediate health effects will be observed. In the long-term, there may be an increased risk of developing cancer.
- In general, the higher the radiation dose the greater the severity of immediate health effects and the greater the possibility of long-term health effects.
- Children exposed to radiation may be more at risk than adults. Radiation exposure to the unborn child is of special concern because the human embryo or fetus is extremely sensitive to radiation.

TREATMENT

- After a nuclear or radiological incident, many victims would likely need to be treated for injuries associated with the explosion, such as burns, wounds, fractures, and bleeding.
- Those who have been contaminated with radioactive materials should decontaminate themselves by removing the outer layer of clothing, placing the clothing in a bag and sealing it, and taking a shower without harsh scrubbing, and wash hair.
- For victims suffering from radiation sickness, treatment would depend on the severity of the symptoms. Physicians will treat symptoms, provide supportive care, and try to prevent infections.
- There are different classes of drugs that can help treat people who have been contaminated with or exposed to radiation.

SHELTER-IN-PLACE* SUPPLY LIST

(Maintain enough for 3 days; check supplies every 6 months)

- **Food**
- **Bottled water (1 gallon per day per person, plus water for pets)**
- **Change of clothing (including undergarments)**
- **Shoes**
- **First aid kit**
- **Paper goods and plastic utensils**
- **Plastic garbage bags**
- **Bedding**
- **Battery-operated radio**
- **Batteries**
- **Flashlight**
- **Medicines**
- **Toiletries**
- **Telephone (hard-wired phones are best)**
- **Emergency-contact phone list**
- **Extra eyeglasses or contact lenses**
- **Baby formula**
- **Pet food**
- **Plastic sheeting**
- **Duct tape**

*** More extensive emergency supply checklists can be found in appendices F and G (see pp. 241–244).**

- Blocking agents prevent absorption of certain radioactive material in the body. **Example:** Potassium iodide
- Decorporation agents speed up elimination of certain radioactive materials from the body. **Examples:** Prussian blue; diethylenetriaminepentaacetate
- Other drugs are used to help recovery from radiation sickness. **Example:** Neupogen®

› Potassium iodide, when taken before or soon after exposure to radioactive iodine, can protect the thyroid gland from absorbing radioactive iodine and developing thyroid cancer, but this does not help against other forms of radioactivity that may come with an attack. In addition, not all attacks will involve the release of radioactive iodine.

› Prussian blue can be used to remove cesium and thallium from the body.

› Diethylenetriaminepentaacetate is a calcium or zinc salt and is typically used for medical imaging of certain organs but can also remove a number of radioactive materials from people's bodies.

› Neupogen® can be used to help the recovery of bone marrow.

› The worst cases of radiation sickness may require blood transfusions and bone marrow transplants.

› There is no vaccine or drug that can make people immune to the effects of radiation.

ADDITIONAL SOURCES OF INFORMATION ON RADIATION EMERGENCIES

› Centers for Disease Control and Prevention Hotline for the Public, 1-888-246-2675 (http://www.bt.cdc.gov/radiation/)

› Conference of Radiation Control Program Directors, 1-502-227-4543 (http://www.crcpd.org)

› Environmental Protection Agency (http://www.epa.gov/radiation/rert)

› Nuclear Regulatory Commission, 1-301-415-8200 (http://www.nrc.gov)

› Federal Emergency Management Agency, 1-202-646-4600 (http://www.fema.gov)

› Radiation Emergency Assistance Center/Training Site, 1-865-576-3131 (http://www.orau.gov/reacts)

› U.S. National Response Team (http://www.nrt.org)

› U.S. Department of Energy, 1-800-dial-DOE (http://www.energy.gov)

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TERRORISM AND THE FOOD SUPPLY

TERRORISM AND THE FOOD SUPPLY

GOAL OF THIS SECTION

To provide information about the challenges involved in protecting the nation's food supply from deliberate contamination.

WHAT THIS SECTION INCLUDES

- **Description of threats involving intentional contamination of food products**
- **Discussion of risks from foodborne illnesses**
- **Review of new systems for information sharing and reporting, and for inspections that will improve the safety of imported and domestic foods**

WHAT THIS SECTION DOES NOT INCLUDE AND WHY

- **Detailed descriptions of specific biological agents are not provided here. (Information on these agents can be found in the "Biological Agents" section [see p. 39].)**
- **Discussion of agroterrorism, or the use of biological agents against the agricultural industry, is not provided here because agencies other than the U.S. Department of Health and Human Services (HHS) have primary responsibility. Primary responsibility for these issues rests with the U.S. Department of Agriculture (USDA) (http://www.usda.gov) and the U.S. Environmental Protection Agency (EPA) (http://www.epa.gov).**

IMPACT OF FOODBORNE ILLNESSES

Most experts believe that terrorist acts involving the food supply are unlikely because they lack the dramatic impact of a bomb or chemical attack, but they are not impossible or implausible scenarios. Being able to detect the difference between an intentional and an unintentional outbreak of foodborne illness is made difficult because foodborne illness outbreaks occur every year in the United States. Alert consumers, health professionals, pharmacists, food retailers, and many others in the food industry play a vital role in the defense against both intentional and unintentional outbreaks of food-related illnesses.

U.S. consumers enjoy one of the safest food supplies in the world, yet a terrorist attack on the food supply is possible. Contaminating food does not require as much technical skill and organization as does weaponizing anthrax. Opportunities for access to the food supply stretch from farms and feedlots to restaurants and cafeterias. For example, terrorists could introduce an agent during the harvesting, packing, shipping, delivery, or preparation stage. Clearly, these acts are possible. Intentional criminal acts, such as the Rajneeshee Cult's *Salmonella* contamination of salad bars in Oregon in the 1980s, demonstrate that fact. Public health officials, the food industry, and health care providers already have a lot of experience with treating and preventing unintentional outbreaks.

However, some causes of foodborne illness, such as *Salmonella* and *E. coli* O157:H7, are also Category B bioterrorism agents. They are designated by HHS' Centers for Disease Control and Prevention (CDC) as Category B agents because they are relatively easy to spread and can make people sick or can even result in death. (Definitions of CDC Categories A, B, and C and details on foodborne organisms that terrorists could use in attacks can be found in the "Biological Agents" section [see p. 39].)

Intentional contamination of the food supply by terrorists is a new threat with unique challenges. Thus, it requires increased food inspection, disease surveillance, laboratory capacity, and awareness among health professionals and the general public.

WHAT ARE THE RISKS?

American consumers spend more than $617 billion a year on food, including $511 billion on food grown on American farms (Strongin 2002).

Overall, the $900 billion (Nestle 2002) U.S. food industry accounts for 20 percent of the gross national product and employs 14 million people directly and another 4 million people in related industries. The farm-to-table process, thus, involves millions of people who handle a variety of foods every day.

INTENTIONAL CONTAMINATION OF THE FOOD SUPPLY BY TERRORISTS IS A NEW THREAT WITH UNIQUE CHALLENGES.

Thus, it requires increased food inspection, disease surveillance, laboratory capacity, and awareness among health professionals and the general public.

Foodborne illnesses are more common than most people realize. They include infections caused by bacteria such as *Salmonella*, *Shigella*, *E. coli*, and *Listeria*; and by parasites such as ***Cryptosporidium*** and ***Cyclospora***. According to CDC, there are approximately 76 million illnesses; 325,000 hospitalizations; and 5,000 deaths every year due to naturally occurring foodborne illnesses in the United States (Mead et al. 1999). The exact numbers are unknown because many people just wait for their symptoms to go away and do not go to see a doctor. Even if someone seeks professional medical advice, the health professional may not attribute the case to a foodborne illness and will not report it to the local health department. The estimated annual costs for medical treatment and lost productivity due to naturally occurring foodborne illnesses range from $7 to $37 billion (Democratic Staff of the Commerce Committee 2004).

Deliberate contamination of the food supply could have a devastating public health and economic impact, with the possibility of global consequences. For example, fearful public reaction to bovine spongiform encephalopathy, known also as BSE or "mad cow disease," and the refusal of Europe and Japan to import United States beef demonstrated how quickly a domestic food-related health issue can become a global economic issue.

WHAT ARE THE SYMPTOMS?

Foodborne illnesses cause symptoms such as nausea, vomiting, diarrhea, or fever. Symptoms can occur between 1 hour and 3 weeks after eating contaminated food, depending on the agent ingested (bacterial, viral, or parasitic), so tracing the source of a foodborne outbreak can be very complicated and time consuming (USDA Food Safety and Inspection Service 2003).

Certain people can suffer more severe and serious reactions to naturally occurring illnesses. Very young children; pregnant women; older adults; and people with compromised immune systems due to chemotherapy, HIV/AIDS, or other conditions are particularly vulnerable. These groups would be at greatest risk in a terrorist attack and would need special attention from health professionals and public health officials.

To help health professionals be on the alert for foodborne illnesses, several associations and federal agencies collaborated in 2004 to produce a free educational primer on food safety called "Diagnosis and Management of Foodborne Illnesses: A Primer for Physicians and Other Health Care Professionals" (http://www.ama-assn.org/ama/pub/category/print/3629.html). The collaborators were the American Medical Association and American Nurses Association, along with CDC, HHS' Food and Drug Administration (FDA), and the USDA's Food Safety and Inspection Service (FSIS).

The primer has consumer-friendly charts and tables, and tips on how to prevent food-related diseases. It also helps health professionals recognize that any patient with foodborne illness could be the first case of a more widespread outbreak.

THE ROLES OF FDA AND USDA IN FOOD SAFETY AND SECURITY

Two federal agencies account for the majority of food safety spending and regulatory responsibilities: FDA, within HHS, and FSIS, within USDA. The U.S. Secretaries of HHS and USDA have publicly agreed to coordinate their responses to the various threats, risks, and vulnerabilities that the agrarian sector and the food supply are facing (Dyckman 2003).

FDA

FDA is responsible for overseeing all domestic and imported food sold in interstate commerce, including shell eggs, bottled water, and wine beverages with less than 7 percent alcohol. FDA inspections take a broad approach to food inspections to ensure that the overall food production process within a given establishment is functioning appropriately. To do this, FDA conducts a scientific evaluation and risk analysis to analyze potential hazards associated with the foods under its jurisdiction. Next, the agency identifies critical control points in a food's production at which the potential hazard could be controlled or eliminated; this includes processing, shipping, consumption, etc. Most importantly, FDA establishes preventative measures and procedures to monitor the correct use of these measures; for example, reprocessing or disposing of food if the minimum cooking temperature is not met. In addition, FDA also oversees animal drugs, feeds, and veterinary devices. FDA has about 770 inspectors for 57,000 food establishments and 132 ports. Once proper preventative measures and monitoring procedures are in place, FDA does a comprehensive evaluation of a specific food establishment about every 5 years.

FSIS

In contrast, FSIS is responsible for a more ongoing inspection of the foods under its jurisdiction. FSIS, a public health regulatory agency of USDA, protects consumers by ensuring that meat, poultry, and egg products (e.g., dried egg yolks, scrambled egg mix, liquid eggs), those foods not inspected by FDA, are safe, wholesome, and accurately labeled. Due to the fact that the production of these foods requires the slaughter of animals, much of USDA inspections focus on the ensuring of sanitary conditions for all slaughter and processing activities. This type of scrutiny requires frequent, even daily, onsite inspections. FSIS has more than 7,600 inspectors and veterinarians in meat, poultry, and egg product plants every day and at ports-of-entry to prevent, detect, and act in response to food safety emergencies.

FDA and USDA have both issued a number of industry security guidance documents, which can be found on their Web sites. Examples include:

- USDA, "FSIS Security Guidelines for Food Processors" (http://www.fsis.usda.gov/oa/topics/biosecurity2.htm)
- FDA, "Food Producers, Processors, and Transporters: Food Security Preventive Measures Guidance" (http://vm.cfsan.fda.gov/~dms/secguid6.html)
- FDA, "Retail Food Stores and Food Service Establishments: Food Security Preventive Measures Guidance" (http://vm.cfsan.fda.gov/~dms/secguid5.html)

CDC, EPA, and U.S. Customs and Border Protection (Customs) also have some limited responsibilities for food security. CDC reports and tracks foodborne disease, EPA evaluates environmental safety (e.g., levels of pesticides and herbicides), and Customs monitors food imports.

NEW REGULATIONS UNDER THE BIOTERRORISM ACT

The Public Health Security and Bioterrorism Preparedness and Response Act (Bioterrorism Act) of 2002 provides authorization for a series of federal actions that will help protect the American public against bioterrorism. In response to the food safety requirement of the act, FDA has issued the following four regulations:

- Food Facility Registration
- Prior Notice of Imported Food Shipments
- Administrative Detention
- Establishment and Maintenance of Records

More information on the provisions of the act that apply to FDA can be found at http://www.fda.gov/oc/bioterrorism/bioact.html.

Food Facility Registration

Under the Bioterrorism Act, companies that manufacture, process, pack, or hold food for consumption in the United States must register with FDA. In October 2003, FDA launched an electronic system that provides each registrant with a unique number. More than 200,000 foreign and domestic establishments are registered, and there are several hundred more new registrants each week. The ID numbers will help FDA quickly identify and notify food processors or other facilities involved in deliberate or accidental food contamination.

By registering companies that do business with the U.S. food market, federal officials will have the first-ever roster of trade partners, along with basic information that will make it easier to "trace back" foodborne illnesses.

Prior Notice of Imported Food Shipments

Companies must now provide advance notice to FDA about food shipments entering the United States. The law covers all human and animal food, drinks, and dietary supplements imported or offered for import to this country. The amount of advance notice needed depends on the mode of transportation being used but at a minimum ranges between 2 and 8 hours. FDA expects to receive roughly 25,000 notifications per day about incoming shipments. Under the new law, FDA will commission thousands of Customs officers to conduct investigations and examinations of foods imported through ports and other locations. FDA and Customs are working together to share information and computer systems and to keep food imports safe without creating unnecessary delays. Though Customs cannot perform physical inspections of every shipment, notification will allow federal inspectors to target their resources more effectively.

Administrative Detention

FDA is now authorized to administratively detain suspect food. This means that FDA can remove food from the food supply if it has credible evidence or information that it presents a threat of serious adverse health consequences or death to humans or animals. The final regulation clarifies the agency's administrative detention procedures and the process for appealing the detention order.

Establishment and Maintenance of Records

Another new regulation under the Bioterrorism Act creates a requirement regarding the establishment and maintenance, for no longer than 2 years, of records by persons (excluding farms and restaurants) who manufacture, process, pack, transport, distribute, receive, hold, or import food. The records that must be kept by this regulation are those that are needed to allow the Secretary to identify the immediate previous sources and immediate subsequent recipients of food, including its packaging, in order to address credible threats of serious adverse health consequences or death to humans or animals.

FOODNET

Detecting a terrorist attack on the food supply requires some kind of real-time alarm to indicate that more people are experiencing symptoms than would normally be the case with natural causes. Flu and normal outbreaks of foodborne diseases affect many people every year. Statistics on this number would serve as a baseline of the "typical" number of occurrences of certain illnesses. Without accurate baseline levels of these common illnesses, it would be difficult to detect, diagnose, and treat illnesses due to a terrorist attack. Most existing reporting systems rely on "passive surveillance," meaning generally that:

- A sick person visits a doctor
- The doctor takes a sample and sends it to the laboratory for evaluation
- The clinical laboratory tests a sample, finds bacteria or parasites, and reports the finding to the state health department
- The state health department makes a report to CDC

No overall national disease-tracking system exists yet. However, in the mid-1990s, CDC began to develop the Foodborne Diseases Active Surveillance Network (FoodNet) (http://www.cdc.gov/foodnet), to help public health experts track and detect existing patterns of foodborne diseases. FoodNet has expanded from five states in 1995 to include 10 states and more than 450 clinical laboratories, with collaboration among CDC, USDA, and FDA.

As of 2004, information is being collected on every laboratory-diagnosed case of bacterial pathogens, including *Salmonella*, *Shigella*, *Campylobacter*, *E. coli* O157:H7, *Listeria monocytogenes*, *Yersinia enterocolitica*, and *Vibrio*; and parasitic organisms, including *Cryptosporidium* and *Cyclospora* infections among residents in the areas within the 10 states where FoodNet collects information.

PULSENET

Another promising use of technology in food safety is "DNA fingerprinting." This molecular system uses networked computers to identify distinctive patterns and genetic makeup of *E. coli* and other bacteria and match strains of bacteria from

PULSENET ENABLES CDC TO DETERMINE

when people in different locations are becoming sick from a single source of contamination based on the bacteria's specific DNA.

different locations. PulseNet enables CDC to determine when people in different locations are becoming sick from a single source of contamination based on the bacteria's specific DNA. If scientists can determine the source of contamination, it may be possible to track down other people who are ill or may become ill.

SPECIAL CONCERNS: TAMPERING AND RECALL

Safety inspections and surveillance systems are part of a comprehensive program to improve food safety. But consumers must also play an active role by noticing anything unusual about their food. Consumer education and vigilance may be the best protection against food-tampering. The FDA Center for Food Safety and Applied Nutrition distributes consumer guides and tips to prevent illness by increasing awareness of the risk of food tampering (http://www.cfsan.fda.gov/~dms/fstamper.html). The Center for Food Safety and Applied Nutrition recommends the following to detect tampering at the grocery store:

- **Carefully examine all food product packaging.** Be aware of the normal appearance of food containers. That way you'll be more likely to notice if an outer seal or wrapper is missing. Compare a suspect container with others on the shelf.
- **Check any anti-tampering devices on packaging.** Make sure the plastic seal around the outside of a container is intact or that the safety button on the lid of a jar is down.
- **Don't purchase products if the packaging is open, torn, or damaged.** This includes products on the shelf or in the refrigerator or freezer sections of the grocery store.
- **Don't buy products that are damaged or that look unusual.** For example, never purchase canned goods that are leaking or that bulge at the ends. Likewise for products that appear to have been thawed and then refrozen.
- **Check the "sell-by" dates** printed on some products and only buy items within that time frame.

Once consumers get home, they should check purchases for the following:

- **When opening a container, carefully inspect the product.** Don't use products that are discolored, moldy, have an off odor, or that spurt liquid or foam when the container is opened.
- **Never eat food from products that are damaged or that look unusual.** For example, cans that are leaking or that bulge at the ends.

If consumers suspect product tampering at the grocery store, report it to the store manager. Once consumers get a commercial food product home, a suspected tampering incident should be reported to the local police department. If the food contains meat or poultry, consumers should also call USDA's Meat and Poultry Hotline at 1-800-535-4555. If the food contains seafood, produce, or eggs, consumers should call FDA's 24-hour emergency number (1-301-443-1240) or its nonemergency number (1-888-SAFEFOOD).

A food recall is a voluntary action by a manufacturer or distributor to protect the public from products that may cause health problems or possible death. Neither USDA nor FDA has mandatory recall authority. One exception for FDA is that infant formula recalls are mandatory. USDA will issue a recall announcement for recalls of foods under its jurisdiction. For FDA regulated foods, FDA will issue a recall announcement if a company does not do so within 24 hours. These announcements are meant to alert consumers about dangerous foods that they may have in their homes.

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ENVIRONMENTAL SAFETY AND TESTING

07

ENVIRONMENTAL SAFETY AND TESTING

GOAL OF THIS SECTION

To provide information on terrorist threats to the air and water supply in the United States.

WHAT THIS SECTION INCLUDES

- **A description of threats to air and water**
- **The importance of environmental surveillance and monitoring systems**

WHAT THIS SECTION DOES NOT INCLUDE AND WHY

- **Detailed descriptions of waterborne and airborne toxins because any one of thousands of substances could be used to contaminate air or water. However, a number of substances of high concern are included in the sections on terrorism agents.**

WATER SUPPLY

Water has always been a strategic target during times of war, and the fear of a terrorist threat to the water supply is intense and widespread. Most experts agree that the actual risk that an attack on the water supply would cause casualties is low because the millions of gallons of water would dilute the toxins, or the chlorination, ozone, filters, or other means of water purification at the treatment plant would render the toxins inactive (Johns Hopkins Center for Public Health Preparedness 2004). However, water supply and distribution systems are vulnerable components of the nation's critical infrastructure. In addition to the water supply, the infrastructure for drinking and wastewater includes treatment plants, pumping stations, pipelines, and storage facilities. Nationally, there are more than 168,000 public drinking water facilities, with tens of thousands of miles of aqueducts and pipelines in remote rural areas and other unguarded locations.

Terrorist threats to the water supply include:

- Deliberate contamination with biological, chemical, or radiological agents
- Bombs or explosives at pumping stations or other critical facilities
- Sabotage and disruptions of the distribution of drinking water or firefighting supplies

Many environmental health experts are concerned about unguarded chlorine gas supplies at water treatment facilities, which terrorists could release into the air or water or put into the food supply. Most treatment plants use chlorine to kill bacteria and viruses in drinking water, but in stronger concentrations, chlorine causes choking and tissue damage and can be fatal (Centers for Disease Control and Prevention 2003). To reduce terrorism risks from chlorine, some treatment plants have converted to safer purification technologies, such as sodium hypochlorite.

No known terrorist act has ever involved the water supply. However, public health officials had a water supply crisis in the spring of 1993, when water contaminated by a parasite called *Cryptosporidium* made more than 400,000 people sick with diarrhea in Milwaukee, WI. Contaminated water from Lake Michigan entered a city water treatment plant. This contaminated water was then inadequately treated. The parasite is present in animal waste and may have come from a nearby sewage plant or slaughterhouse (MacKenzie et al. 1994).

In response to this crisis, public health officials in Milwaukee set up one of the nation's first disease-monitoring systems to help them track future outbreaks, and the city water treatment plant improved its filtration system. Emergency preparedness courses often cite the Milwaukee experience to illustrate the rapid and widespread consequences of water contamination.

PROTECTING THE WATER SUPPLY

The Environmental Protection Agency (EPA) is the agency with primary responsibility for water infrastructure security, working in coordination with the U.S. Department of Homeland Security (DHS). EPA is responsible for protecting the nation's water supply by enforcing the Clean Water Act (http://www.epa.gov/region5/water/cwa.htm) and the Safe Drinking Water Act (http://www.epa.gov/safewater/sdwa/sdwa.html), and the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. In January 2003, EPA established a new homeland security research center to address detection and characterization of contaminants, response and mitigation, and prevention and protection of water systems. EPA's Water Security Division, also established in 2003, assists the water sector by providing guidance, tools, training, and technical assistance to address water security concerns. More information can be found at http://www.epa.gov/watersecurity.

Water treatment and distribution systems are public utilities, and industry associations have played a major role in their preparedness and protection efforts. The Public Health, Security, and Bioterrorism Preparedness and Response Act requires all public water systems serving more than 3,000 people to prepare vulnerability assessments and submit them to EPA for review and certify the completion of emergency response plans (http://cfpub.epa.gov/safewater/watersecurity/bioterrorism.cfm). While developing their plans, public drinking water systems need to partner with their community waste water utilities and local government officials, including law enforcement and public health. Continuing to update vulnerability assessments and practice emergency response plans is essential for an effective response in the event of an emergency.

The American Water Works Association; Sandia National Laboratory; and many other industries, state drinking water agencies, and research organizations are working with EPA to help water systems reduce any possible risks to their water supply (Greenblatt et al. 2003; EPA 2004).

HHS' ROLE IN WATER SECURITY

While the role of the U.S. Department of Health and Human Services (HHS) in water security is to provide technical assistance and support during emergency response and recovery, the Federal Emergency Management Agency and the U.S. Army Corps of Engineers may have lead roles. Within HHS' Centers for Disease Control and Prevention (CDC), the Environmental Public Health Readiness Branch of the National Center for Environmental Health works with federal, state, and local agencies after natural and technological disasters. CDC's environmental disaster epidemiologists help communities to assess the impact of hurricanes, floods, and other extreme weather conditions on health (http://www.cdc.gov/nceh/hsb/disaster/default.htm).

CDC team's activities may include conducting laboratory tests on water samples to identify toxic contaminants, setting up surveillance programs to monitor the number of people with waterborne diseases or other serious health risks, setting up programs to control the spread of disease, and providing other support and technical assistance.

AIR

Terrorists could release harmful chemical and biological agents into the air, which might not be recognized for several days. An airborne communicable disease can spread through a ventilation system or pass person-to-person through coughing or sneezing before anyone realizes what has happened.

Noncommunicable bioagents, like anthrax, also spread readily through the air, and technology has not kept pace with the need to detect them or remove them from the air by advanced surveillance and filtering techniques. Recognizing these technical gaps, the federal government is exploring several new biosurveillance programs, including new sensor networks and new health-tracking data analysis programs (http://www.dhs.gov/dhspublic/display?theme=43&content=3092&print=true).

Many federal agencies are now working to coordinate their scientific, technical, and regulatory responsibilities. These agencies must share the responsibility for monitoring and protecting air quality. EPA is responsible for outdoor air quality, but the National Aeronautics and Space Administration and the National Oceanic and Atmospheric Administration operate weather satellites that would provide critical information during a large-scale chemical attack. For example, satellite photos, along with meteorological data about wind direction, speed,

and temperature, could help officials determine the best responses to protect the public health by advising evacuation or shelter-in-place.

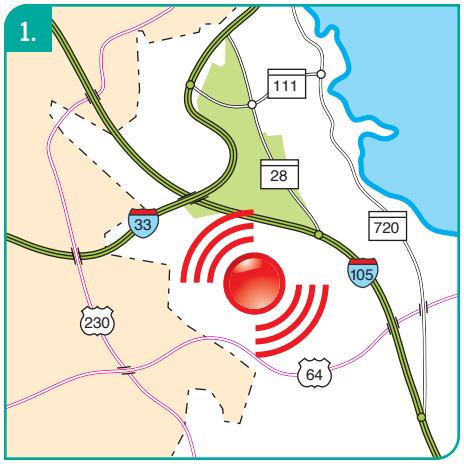
CDC's National Institute for Occupational Safety and Health (NIOSH) has the primary responsibility for research and recommendations on air quality in the workplace, thus protecting the health of the workforce. In 2002, NIOSH issued detailed guidance for defending building environments against airborne chemical, biological, or radiological attacks. Its recommendations address physical security, ventilation and filtration, maintenance, and other preventive strategies based on vulnerability assessments.

EPA's Environmental Technology Verification Program (http://www.epa.gov/etv) is working with DHS to develop new ways to monitor, measure, detect, and filter out, rinse out, or otherwise remove chemical and biological warfare agents from indoor air and water systems. The program is funding research to develop the next generation of environmental monitoring technologies and warning programs.

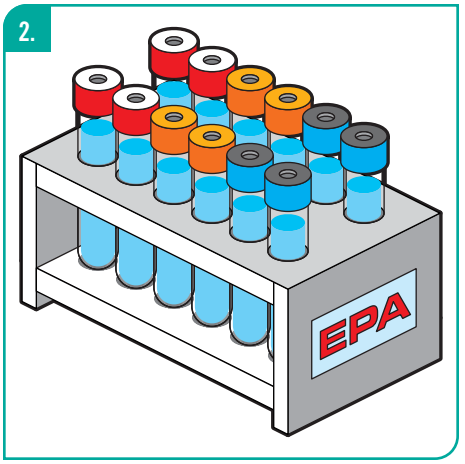
BIOWATCH

Project BioWatch is an air-monitoring system that will provide an early warning for biothreats in urban areas. The initiative is led by DHS, in partnership with EPA, and CDC's Laboratory Response Network. This biosurveillance system includes round-the-clock air-monitoring stations, which have been operating in more than 30 cities across the nation since 2003.

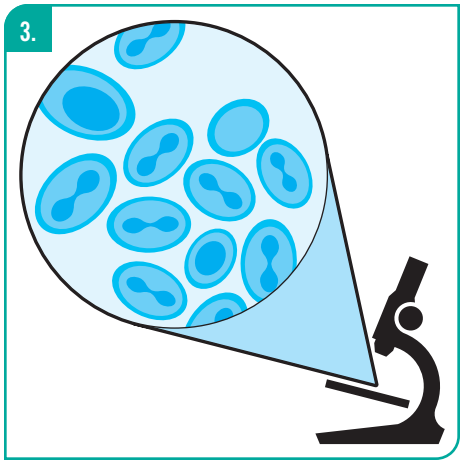
FIGURE 7–1: HOW BIOWATCH WORKS



Sensors are located in cities throughout the country.



EPA collects samples and sends them to CDC.



CDC analyzes samples.

IF AGENT DETECTED:

Rapid-response protocol implemented: DHS, HHS, EPA, and the Federal Bureau of Investigation (FBI).

How BioWatch Works

Technicians collect air samples from BioWatch sensors at least once a day. The samples then go to labs to undergo testing for the presence of specific bioagents, including anthrax, smallpox, and plague. In general, EPA collects the samples and designated labs that are a part of the Laboratory Response Network, including the Rapid Response and Advance Technology lab at CDC, analyze them.

Rapid Response Protocols

If lab workers at the Laboratory Response Network facilities or CDC lab workers detect a bioagent, a rapid response protocol goes into effect. This protocol involves DHS, CDC, EPA, and the Federal Bureau of Investigation. Though federal officials have not released the protocol to the public, they have indicated that CDC would notify the other agencies and the designated members of the rapid response team would quickly make decisions and communicate a coordinated response and mitigation strategy (with recommended actions) to local health departments (Marburger 2003).

Critics say that the air-monitoring technology is not sensitive enough to detect small releases of biological or chemical toxins. Critics also point out that BioWatch does not monitor indoor releases and that there can be delays of several hours between the collection and the analysis of air samples (The Associated Press 2003).

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THE ROLE OF THE FEDERAL GOVERNMENT

08

THE ROLE OF THE FEDERAL GOVERNMENT

GOAL OF THIS SECTION

To explain the roles and responsibilities held by the U.S. Department of Health and Human Services (HHS), the U.S. Department of Homeland Security (DHS), and other agencies of the federal government to manage a range of public health crises, from naturally occurring disasters to terrorist attacks, namely:

- **The role HHS would play in response to terrorist threats to public health**
- **How HHS, DHS, and other federal agencies would work together in a crisis**
- **The responsibilities of various HHS offices and agencies in a crisis**
- **The legal basis for public health authority in a crisis**

WHAT THIS SECTION INCLUDES AND WHY

This section clarifies how various parts of the federal government work together and with state, local, and tribal officials to manage a health crisis. Responses to crises are complex. In recent years, there have been changes in the types of public health challenges facing our nation and the world. In addition, there have been changes in crisis response systems, as well as response organizations, and their responsibilities. Because these roles will continue to evolve, updated information will be made available at http://www.hhs.gov/emergency. Information published in this guide is current as of spring 2005.

WHAT THIS SECTION DOES NOT INCLUDE

A detailed explanation of the National Response Plan (NRP) or the National Incident Management System (NIMS) is not included. The purpose of the section is to explain the public health response. See the NRP (http://www.dhs.gov/nrp) and NIMS (http://www.dhs.gov/interweb/assetlibrary/NIMS-90-web.pdf) Web sites for descriptions.

WHAT TO EXPECT FROM HHS

HHS is the U.S. government's principal agency for protecting the health of all Americans. The overall goal of HHS' preparedness and response program is to ensure sustained public health and medical preparedness within our communities and our nation in defense against terrorism, infectious disease outbreaks, medical emergencies, and other public health threats.

In a public health emergency, HHS' responsibilities include:

- Monitoring, assessing, and following up on people's health
- Ensuring the safety of workers responding to an incident
- Ensuring that the food supply is safe
- Providing medical, public health, and mental/behavioral health advice
- Establishing and maintaining a registry of people exposed to or contaminated by a given agent

To fulfill this role, HHS works closely with state, local, and tribal public health departments; DHS; other federal agencies; and medical partners in the private and nonprofit sectors. Under the Public Health Service Act (see appendix D [p.234]), HHS has the authority to:

- Declare a public health emergency
- Make and enforce regulations (including isolation and quarantine) to prevent the introduction, transmission, or spread of communicable diseases into the United States or from one state or possession into another
- Conduct and support research and investigation into the cause, treatment, or prevention of a disease or disorder

- Direct the deployment of officers of the Public Health Service, a division of HHS, in support of public health and medical operations
- Provide public health and medical services and advice
- Provide for the licensure of biological products

On behalf of the Secretary, the Assistant Secretary for Public Health Emergency Preparedness coordinates the Department's efforts to prevent, prepare for, respond to, and recover from public health and medical consequences of disasters or emergencies.

THE NATIONAL RESPONSE PLAN

The structures, capabilities, and resources of federal agencies are unified in the NRP, an all-hazards plan that establishes a single comprehensive framework for the management of domestic incidents. The NRP can be found in its entirety on the Web (http://www.dhs.gov/nrp).

PUBLIC HEALTH OR MEDICAL EMERGENCIES

Federal public health and other medical assistance in federally declared public health or medical emergencies is provided under Emergency Support Function (ESF) #8 of the NRP. ESF #8 is 1 of 15 ESFs, which are described later in this section. HHS is the primary agency for ESF #8 and coordinates federal health and medical assistance in support of state, local, and tribal jurisdictions. HHS performs this responsibility with DHS, which has overall responsibility for domestic incident management.

The following table describes the coordinated federal assistance to supplement state, local, and tribal resources in response to public health and medical care needs in a national crisis (called "Incident of National Significance" in the NRP). It also includes veterinary assistance. Please note that HHS has the authority to implement the activities described below, but specific activities described under each function will be implemented as appropriate for a specific incident.

It is important to recognize that state, local, or tribal governments have the initial responsibility for responding to an emergency and protecting the people, property, and environment within their jurisdiction. The federal government generally supports the state, local, and tribal response when one or more of the following occurs:

- **A state requests assistance from the federal government and the President**
- **The President declares a state of emergency**
- **An incident takes place in areas that are owned or controlled by the federal government**

Federal response is coordinated through DHS.

In addition to these functions, HHS is responsible for continuing actions to acquire and assess information on the incident. Staff continues to identify the nature and extent of public health and medical problems and establishes appropriate monitoring and public surveillance. Continuing responsibilities include:

- Activation of health/medical response teams
- Coordination of requests for medical transportation
- Coordination for obtaining, assembling, and delivering medical equipment and supplies to the incident area
- Communications to coordinate federal public health and medical assistance
- Information requests, which are referred to ESF #15
- After-Action Reports

TABLE 1. ESF #8—PUBLIC HEALTH AND MEDICAL SERVICES: ROLES AND RESPONSIBILITIES

FUNCTION	DESCRIPTION
Assessment of Public Health/ Medical Needs	In collaboration with DHS, deploys ESF #8 personnel. Assesses public health and medical needs. Assesses the public health care system/facility infrastructure.
Health Surveillance	In coordination with state health agencies, enhances existing surveillance systems to monitor the health of the general population and special high-risk populations. Carries out field studies and investigations. Monitors injury and disease patterns and potential disease outbreaks. Provides technical assistance and consultations on disease and injury prevention and precautions.
Medical Care Personnel	Deploys HHS staff (e.g., U.S. Public Health Service Commissioned Corps). Requests support from the U.S. Department of Defense (DOD) in casualty clearing/staging and other missions, as needed. Seeks individual clinical health and medical care specialists from the Department of Veterans Affairs (VA) to assist state, local, and tribal personnel.
Health/Medical Equipment and Supplies	Deploys assets from the Strategic National Stockpile. Requests DHS, DOD, or VA to provide medical equipment and supplies, including medical, diagnostic, and radiation-emitting devices; pharmaceuticals; and biologic products, in support of immediate medical response operations and for restocking health care facilities in an area affected by a major disaster or emergency.
Patient Evacuation	Requests DOD to evacuate seriously ill or injured patients to locations where hospital care or outpatient services are available; DOD will be responsible for regulating and tracking patients transported on DOD assets to appropriate treatment facilities (e.g., National Disaster Medical System non-federal hospitals).
Patient Care	Tasks HHS, the Medical Reserve Corps, VA, DOD, and DHS to provide available personnel to support inpatient hospital care and outpatient services to victims who become seriously ill or injured regardless of location (may include mass care shelters).
Safety and Security of Human Drugs, Biologics, Medical Devices, Veterinary Drugs, etc.	Ensures the safety, efficacy, and advises industry on security measures of regulated human and veterinary drugs, biologics (including blood and vaccines), medical devices (including radiation-emitting and screening devices), and other HHS-regulated products.
Blood and Blood Products	Monitors blood availability and maintains contact with the American Association of Blood Banks Interorganizational Task Force on Domestic Disasters and Acts of Terrorism to determine the need for blood, blood products, and the supplies used in their manufacture, testing, and storage; the ability of existing supply chain resources to meet these needs; and any emergency measures needed to augment or replenish existing supplies.
Food Safety and Security	In cooperation with ESF #11, ensures the safety and security of federally regulated foods. (Note: HHS, through the Food and Drug Administration, has statutory authority for all domestic and imported food except meat, poultry, and egg products, which are under the authority of the U.S. Department of Agriculture Food Safety and Inspection Service.)
Agriculture Safety and Security	In cooperation with ESF #11, ensures the safety and security of food-producing animals, animal feed, and therapeutics. (Note: HHS, through the Food and Drug Administration, has statutory authority for animal feed and for the approval of animal drugs intended for both therapeutic and nontherapeutic use in food animals as well as companion animals.)
Worker Health/Safety	Requests the U.S. Department of Labor/Occupational Safety and Health Administration to implement the processes in the Worker Safety and Health Support Annex to provide technical assistance for worker safety and health. Requests support from the U.S. Department of Labor and other cooperating agencies to assist in monitoring the health and well-being of emergency workers, performing field investigations and studies addressing worker health and safety issues, and providing technical assistance and consultation on worker health and safety measures and precautions.

TABLE 1. ESF #8—PUBLIC HEALTH AND MEDICAL SERVICES: ROLES AND RESPONSIBILITIES *(cont.)*

FUNCTION	DESCRIPTION
All-Hazard Public Health and Medical Consultation, Technical Assistance, and Support	Assists in assessing public health and medical effects resulting from all hazards (e.g., assessing exposures on the general population and on high-risk population groups; conducting field investigations, including collection and analysis of relevant samples; providing advice on protective actions related to direct human and animal exposures, and on indirect exposure through contaminated food, drugs, water supply, and other media; and providing technical assistance and consultation on medical treatment, screening, and decontamination of injured or contaminated individuals). At the request of a state (who, along with local governments, retain the primary responsibility for victim screening or decontamination) or other federal agency, deploys teams with limited capabilities for victim decontamination (e.g., National Disaster Medical System or U.S. Department of Energy assistance for nuclear/radiological incidents); these teams typically arrive on scene within 24–48 hours.
Behavioral Health Care	Assists in assessing mental health and substance abuse needs. Provides disaster mental health training materials for disaster workers. Provides liaison with assessment, training, and program development activities undertaken by federal, state, local, and tribal mental health and substance abuse officials.
Public Health and Medical Information	Provides public health, disease, and injury prevention information that can be transmitted to members of the general public who are located in or near affected areas.
Vector Control	Assists in assessing the threat of vector-borne diseases. Conducts field investigations, including the collection and laboratory analysis of relevant samples. Provides vector control equipment and supplies. Provides technical assistance and consultation on protective actions regarding vector-borne diseases. Provides technical assistance and consultation on medical treatment of victims of vector-borne diseases.
Potable Water/Wastewater and Solid Waste Disposal	In coordination with ESF #3 and ESF #10, assists in assessing potable water, wastewater, solid waste disposal issues, and other environmental health issues. Conducts field investigations, including collection and laboratory analysis of relevant samples. Provides water purification and wastewater/solid waste disposal equipment and supplies. Provides technical assistance and consultation on potable water and wastewater/solid waste disposal issues.
Victim Identification/ Mortuary Services	Requests DHS and DOD to assist in providing victim identification and mortuary services; establishing temporary morgue facilities; performing victim identification by fingerprinting, forensic dental, and/or forensic pathology/anthropology methods; and processing, preparing, and disposing of remains.
Protection of Animal Health	In coordination with ESF #11, protects the health of livestock and companion animals by ensuring the safety of the manufacture and distribution of foods and drugs given to animals used in human food production.

ALL EMERGENCY SUPPORT FUNCTIONS IN THE NATIONAL RESPONSE PLAN

The Public Health and Medical Services function is one of 15 ESFs under the NRP. The following list includes all ESFs and the agencies responsible for accomplishing each one:

- **The ESF Coordinator,** listed first, is the agency with primary ongoing responsibilities throughout the prevention, preparedness, response, recovery, and mitigation phases of incident management.
- **Primary Agencies** orchestrate federal support within a functional area, provide staff, manage mission assignments, and coordinate with support agencies.
- **Support Agencies** (not listed in table 2 but described in the full NRP [http://www.dhs.gov/nrp]), at the request of the Coordinating and Primary Agency, conduct operations, furnish personnel and resources, assist with assessments, and provide ongoing planning and other essential functions. Many federal agencies play critical roles in each ESF.

TABLE 2. NATIONAL RESPONSE PLAN EMERGENCY SUPPORT FUNCTIONS

FUNCTION	ESF COORDINATOR WITH PRIMARY AGENCY(IES) RESPONSIBLE FOR ACCOMPLISHING THE MISSION OF THE ESF *Note: For some ESFs, one agency serves as both the ESF Coordinator and Primary Agency.*	SCOPE
ESF #1 Transportation	U.S. Department of Transportation	• Processing and coordinating requests for federal and civil transportation support • Reporting damage to transportation infrastructure as a result of the incident • Coordinating alternate transportation services • Coordinating restoration and recovery of transportation infrastructure • Performing activities conducted under the direct authority of U.S. Department of Transportation elements, such as air, maritime, surface, rail, and pipelines • Coordinating and supporting prevention/preparedness/mitigation among transportation infrastructure stakeholders at the state and local levels
ESF #2 Communications	U.S. Department of Homeland Security/ National Communications System	• Coordinating federal actions to provide temporary telecommunication and information technology services • Restoring telecommunication and information technology infrastructure
ESF #3 Public Works and Engineering	U.S. Department of Defense/ U.S. Army Corps of Engineers *-with-* U.S. Department of Homeland Security/ Emergency Preparedness and Response/ Federal Emergency Management Agency	• Conducting pre- and post-incident assessments of public works and infrastructure • Executing emergency contract support for life-saving and life-sustaining services • Providing technical assistance to include engineering expertise, construction management, and contracting and real estate services • Providing emergency repair of damaged infrastructure and critical facilities • Implementing and managing the Federal Emergency Management Agency Public Assistance Program and other recovery programs
ESF #4 Firefighting	U.S. Department of Agriculture/ U.S. Forest Service	• Managing and coordinating firefighting activities, including the detection and suppression of fires on federal lands • Providing personnel, equipment, and supplies in support of state, local, and tribal agencies involved in rural and urban firefighting operations
ESF #5 Emergency Management	U.S. Department of Homeland Security/ Emergency Preparedness and Response/ Federal Emergency Management Agency	• Responsible for all functions critical to support and facilitate multiagency planning and coordination • Deployment and staffing of the U.S. Department of Homeland Security emergency response teams • Incident action planning • Coordination of operations, logistics and material, and direction and control • Information management • Facilitation of requests for federal assistance • Resource acquisition and management • Worker safety and health • Facilities management • Financial management • Other support as required

ESF #6 Mass Care, Housing, and Human Services	U.S. Department of Homeland Security/ Emergency Preparedness and Response/ Federal Emergency Management System *-with-* American Red Cross	• Mass care, including nonmedical mass care services to include sheltering of victims, organizing feeding operations, providing emergency first aid at designated sites, collecting and providing information on victims to family members, and coordinating bulk distribution of emergency relief items • Housing, including assistance for short- and long-term housing needs of victims • Human services, including victim-related recovery efforts, such as counseling, identifying support for persons with special needs, expediting processing of new federal benefits claims, assisting in collecting crime victim compensations for acts of terrorism, and expediting mail services in affected areas
ESF #7 Resource Support	General Services Administration	• Resource support to federal, state, local, and tribal governments, including emergency relief supplies, facility space, office equipment, office supplies, telecommunications, contracting services, transportation services, security services, and personnel required to support immediate response activities • Support for requirements not specifically identified in other ESFs, including excess and surplus property
ESF #8 Public Health and Medical Services	U.S. Department of Health and Human Services	• Provide supplemental assistance to state, local, and tribal governments in meeting the public health needs of victims • Assess public health/medical needs, including behavioral health • Public health surveillance • Medical care personnel • Medical equipment and supplies
ESF #9 Urban Search and Rescue	U.S. Department of Homeland Security/ Emergency Preparedness and Response/ Federal Emergency Management Agency	• Coordination and logistical support to urban search and rescue task forces during emergency operations • Needs assessments • Technical advice and assistance to state, local, and tribal government emergency managers
ESF #10 Oil and Hazardous Materials Response	Environmental Protection Agency *-with-* U.S. Department of Homeland Security/ U.S. Coast Guard	• Hazardous materials (oil, chemical, biological, and radiological) response and recovery, including efforts to detect, identify, contain, clean up, or dispose of released oil and other hazardous materials • Environmental safety, and short- and long-term cleanup
ESF #11 Agriculture and Natural Resources	U.S. Department of Agriculture *-with-* U.S. Department of the Interior	• Nutrition assistance by the Food and Nutrition Service, including obtaining food supplies, arranging for food delivery, and authorizing disaster food stamps • Implementing integrated federal, state, local, and tribal response to an outbreak of a highly contagious or economically devastating animal/zootonic disease, an outbreak of a highly infective exotic plant disease, or an economically devastating plant pest infestation. • Assurance of the safety and security of the commercial food supply, including inspection and verification of food safety aspects of slaughter and processing plants, products in distribution and retail sites, and import facilities or ports of entry; laboratory analysis of food samples; control of products suspected to be adulterated; plant closures; foodborne disease surveillance; and field investigations • Protection of natural and cultural resources and historic property resources
ESF #12 Energy	U.S. Department of Energy	• Collecting, evaluating, and sharing information on energy system damage and estimations on the impact of energy system outages within affected areas • Provides information concerning the energy restoration process

TABLE 2. NATIONAL RESPONSE PLAN EMERGENCY SUPPORT FUNCTIONS *(cont.)*

FUNCTION	ESF COORDINATOR WITH PRIMARY AGENCY(IES) RESPONSIBLE FOR ACCOMPLISHING THE MISSION OF THE ESF *Note: For some ESFs, one agency serves as both the ESF Coordinator and Primary Agency.*	SCOPE
ESF #13 Public Safety and Security	*ESF #13 has three Coordinating Agencies:* U.S. Department of Homeland Security U.S. Department of Homeland Security/ Emergency Preparedness and Response/ Federal Emergency Management Agency *-and-* U.S. Department of Justice	• Support for non-investigative/non-criminal law enforcement, public safety, and security capabilities and resources • Support incident management requirements, including force and critical infrastructure protection, security planning and technical assistance, technology support, and public safety in both pre- and post-incident situations
ESF #14 Long-term Community Recovery and Mitigation	U.S. Department of Homeland Security/ Emergency Preparedness and Response/ Federal Emergency Management Agency *-with-* U.S. Department of Commerce U.S. Department of Health and Human Services U.S. Department of Housing and Urban Development U.S. Department of the Treasury *-and-* Small Business Administration	• Generally activated when state and local resources are overwhelmed or inadequate • Working with state, local, and tribal governments; non-government organizations; and private-sector organizations to enable long-term community recovery and reduce or eliminate risk from future incidents, where feasible • Assesses incident impacts • Varies depending on magnitude and type of incident and potential for long-term severe consequences
ESF #15 External Affairs	U.S. Department of Homeland Security	• External affairs support to federal, state, and tribal governments • Public affairs, including coordinating messages among federal, state, local, and tribal governments; establishing a federal Joint Information Center; gathering information; and disseminating information to media and other sources • Community relations, including initial action plan with incident-specific guidance; coordinating with states to assist with dissemination of information; identifying unmet needs; and facilitating collaboration • Congressional affairs, including contact with congressional offices representing affected areas and conducting congressional briefings • International affairs, including coordinating with the U.S. Department of State on all matters of international involvement • State and local coordination, including implementing a system of information sharing and informing officials • Tribal affairs, including providing a Tribal Relations Office to coordinate with tribal governments on all aspects of incident management

HOW HHS WORKS WITH OTHER FEDERAL AGENCIES: WHO IS RESPONSIBLE FOR WHAT IN DIFFERENT SITUATIONS

IN ALL EMERGENCY SITUATIONS

In all disasters, HHS's Secretary's Operations Center becomes operational immediately upon notification and begins the collection, analysis, and dissemination of requests for medical and public health assistance.

HHS operates under the NRP in all situations involving an "Incident of National Significance." This is defined in the NRP as "an actual or potential high-impact event that requires a coordinated and effective response by an appropriate combination of federal, state, local, tribal, and non-governmental and/or private sector entities in order to save lives and minimize damage and provide the basis for long-term community recovery and mitigation activities."

Incidents of national significance are declared by the Secretary of Homeland Security under these criteria:

1. A federal department or agency acting under its own authority has requested the assistance of the Secretary of DHS
2. The resources of state and local authorities are overwhelmed and federal assistance has been requested by the appropriate state and local authorities
3. More than one federal department or agency has become substantially involved in responding to an incident
4. The Secretary of Homeland Security has been directed to assume responsibility for managing a domestic incident by the President

IN A NATURAL DISASTER

DHS coordinates the federal response to a natural disaster, which may include floods, earthquakes, hurricanes, tornadoes, droughts, and epidemics. As in all crises, the Secretary's Operations Center will coordinate medical and public health support to local and state governments. HHS will also gather and analyze data to help identify, monitor, and manage medical and health consequences for the public. HHS's activities will be closely coordinated with several other agencies and organizations, including the Federal Emergency Management Agency under DHS, the National Guard and Reserve, and the American Red Cross.

IN A NATURAL OUTBREAK

As the primary public health agency in the nation, HHS will, through its Centers for Disease Control and Prevention (CDC), work closely with local and state public health officials to identify, track, and monitor outbreaks of diseases. Disease surveillance and detection systems, including the National Electronic Disease Surveillance System, provide the framework for communication of public health information throughout the nation and help public health officials detect and fight outbreaks. CDC has also provided funding and other support to develop additional epidemiological and laboratory capacity for states and territories to address infectious disease. In coordination with DHS, HHS will provide direct public health support—both staff and medical supplies—to a state, if requested by its leadership (see National Response Plan: Biological Incident Annex [http://www.dhs.gov/interweb/assetlibrary/NRP_FullText.pdf]).

Many federal agencies would play a role in the management of an outbreak considered to be an Incident of National Significance, such as pandemic influenza or serious emerging infectious disease. HHS will coordinate all federal response for such an incident.

IN A BIOTERROR ATTACK

HHS has primary responsibility for federal public health and medical response in a bioterrorist incident because response and recovery efforts will rely on public health and medical emergency response. The Assistant Secretary for Public Health Emergency Preparedness will coordinate responses with DHS and other federal and state agencies from the Secretary's Operations Center. HHS will coordinate the federal public health and medical response to a bioterror attack (see National Response Plan: Biological Incident Annex [http://www.dhs.gov/interweb/assetlibrary/NRP_FullText.pdf]).

IN A CHEMICAL INCIDENT

If a chemical attack or other chemical incident occurs, HHS will work as part of the emergency management team in the emergency operations center of the agency with primary responsibility, the Environmental Protection Agency or the DHS/U.S. Coast Guard (see National Response Plan: Oil and Hazardous Materials Annex and ESF #10 [http://www.dhs.gov/interweb/assetlibrary/NRP_FullText.pdf]), in the event that the emergency activates ESF #8. CDC, through its Agency for Toxic Substances and Disease Registry (http://www.atsdr.cdc.gov) and National Institute for Occupational Safety and Health (http://www.cdc.gov/niosh/topics/emres), will assume roles in evaluating chemical spills and environmental contamination and providing safety and health recommendations to responders (e.g., the wearing of personal protective equipment). HHS will determine whether illnesses, diseases, or complaints may be attributed to exposure to a hazardous substance. It will establish disease exposure registries, conduct appropriate testing, and provide information on the health effects of toxic substances.

WHEN RADIOLOGICAL MATERIALS HAVE BEEN RELEASED

DHS is responsible for the overall coordination of incident management activities for all radiological or nuclear Incidents of National Significance. If radiological materials have been released, HHS will work in cooperation with the emergency operations center of DHS and/or the agency it appoints as the coordinating agency. For example:

- Radiological terrorism incidents would be initially coordinated by the U.S. Department of Energy (DOE), unless the material or facilities were either owned or operated by the U.S. Department of Defense (DOD) or licensed by the Nuclear Regulatory Commission. In those cases, the respective agency would serve as the coordinating agency. Radiological terrorism incidents include:
  - Radiological Dispersal Device, e.g., radioactive material plus conventional explosives
  - Improvised Nuclear Device, e.g., "suitcase bomb," crude nuclear bomb
  - Radiation-Emitting Device, e.g., hidden (not exploded) radiological materials used to expose people to radiation (sometimes referred to as a "silent" source)
- Management of an incident at a nuclear facility would be coordinated by the agency that licenses, owns, or operates the facility; this would be the Nuclear Regulatory Commission, DOD, or DOE. For nuclear facilities not licensed, owned, or operated by a federal agency, the Environmental Protection Agency would coordinate incident management.
- In the event of a nuclear weapon accident/incident, DOD or DOE would serve as the coordinating agency, based on custody at the time of the event.

HHS will assess, monitor, and follow people's health; ensure the safety of workers and responders involved in the incident; ensure that the food supply is safe; and provide medical and public health advice. If there is a mass casualty situation, the American Red Cross will take a lead role in management as well.

THE ROLES OF HHS AGENCIES AND OFFICES

HHS OFFICE OF THE SECRETARY EMERGENCY RESPONSE ROLES

Within the Office of the Secretary, the following are the organizations in emergency response:

Immediate Office of the Secretary of HHS

Responsible for the overall response to public health and medical emergencies. The Secretary or his/her designee determines the nature and scope of HHS' response to a public health or medical emergency.

Office of Public Health Emergency Preparedness

(http://www.hhs.gov/ophep)

Working on behalf of the Secretary, directs and coordinates the Department's efforts to prevent, prepare for, respond to, and recover from the public health and medical consequences of disaster or emergency. The Office of Public Health Emergency Preparedness (OPHEP) acts as the liaison office of HHS to DHS. As directed by the Secretary, OPHEP establishes and deploys the Secretary's Emergency Response Team (SERT) to be the Secretary's agent on scene at emergency sites.

› **Secretary's Operations Center**

(http://www.hhs.gov/news/facts/command.html)

Provides a central location of public health information and intelligence for the Secretary of HHS. The Secretary's Operations Center coordinates the response activities of HHS with local, state, federal, and international public health authorities.

› **Secretary's Emergency Response Team**

Directs and coordinates the activities of all HHS personnel deployed to the emergency site to assist local, state, and other federal and government agencies. The Secretary's Emergency Response Team (SERT), which is rapidly deployed, has cross-HHS representation and acts for HHS onsite for all types of public health emergencies, from emerging diseases and terrorism to natural disasters.

Office of the Assistant Secretary for Health

(http://www.hhs.gov/ash)

Directs the Office of the Surgeon General, who operates the U.S. Public Health Service Commissioned Corps, and oversees Regional Health Administrators.

› **Office of Public Health and Science**

(http://www.osophs.dhhs.gov/ophs)

- **Regional Health Administrators**

  (http://www.osophs.dhhs.gov/ophs/rha.htm)

  Oversee public health relationships at the local, regional, and state levels as well as relationships with other federal agency offices in their regions. Regional Health Administrators may, under some circumstances, serve on a SERT.

Office of the Assistant Secretary for Public Affairs

(http://www.hhs.gov/aspa)

Directs HHS' emergency public information and communications efforts.

Office of Intergovernmental Affairs

(http://www.hhs.gov/iga)

› **Regional Directors**

(http://www.hhs.gov/iga/regions.html)

Act as the Secretary's primary representatives, unless a SERT has been deployed. Regional Directors serve as members of a SERT and can be appointed SERT team leader.

› **Regional Emergency Coordinators**

Assists state, local, and tribal public health, medical, emergency management, and law enforcement officials in the development of comprehensive and integrated preparedness and response plans. Regional Emergency Coordinators work with the health and medical planners in their regions to determine response capabilities, when and what type of federal support might be needed, and how federal assistance would be integrated into the region's incident management system. They also serve on SERTs.

THE ROLES OF HHS OPERATING DIVISIONS

Within HHS, the following operating divisions play key roles in the Department's response:

Centers for Disease Control and Prevention

(http://www.bt.cdc.gov)

› Prevents and intervenes on disease and injury.

› Detects and investigates disease outbreaks and other health problems.

› Develops strategies for dealing with the public health aspects of an emergency.

› Plays a role in evaluating chemical spills and environmental contamination and provides safety and health recommendations to responders (e.g., the wearing of personal protective equipment).

Food and Drug Administration

(http://www.fda.gov/oc/opacom/hottopics/bioterrorism.html)

› Assures the safety, efficacy, and security of human and veterinary drugs, biological products, medical devices, our nation's food supply, cosmetics, and products that emit radiation.

- Advances the public health by helping to speed innovations that make medicines and foods more effective, safer, and more affordable.
- Helps the public obtain the accurate, science-based information they need to use medicines and food to improve their health.

Health Resources and Services Administration

(http://www.hrsa.gov/bioterrorism.htm)

- Works to ensure the availability of quality health care to low-income, uninsured, isolated, and special-needs populations that meets their unique health needs.
- Increases access to basic health care for those who are medically underserved.
- Manages the National Bioterrorism Hospital Preparedness Program as well as the Bioterrorism Training and Curriculum Development Program.
- Maintains an Emergency Response Center capability, which is activated in emergency situations.

Indian Health Service

(http://www.ihs.gov/PublicInfo/PublicAffairs/Welcome_Info/IHSintro.asp)

- Provides a comprehensive health service delivery system, including personal and public health care for American Indians and Alaska Natives.
- Addresses issues pertaining to mental health, environmental health, engineering, dentistry, pharmaceuticals, nursing, laboratory, and community health and oversees varied surveillance activities for disease outbreaks and other health problems among American Indians and Alaska Natives.
- Provides special water purification and waste disposal assistance during national and international disasters and emergencies.

Substance Abuse and Mental Health Services Administration

(http://www.samhsa.gov/)

- Addresses the psychosocial factors (mental health, substance abuse, and related concerns) in preparedness, response, and recovery for natural and manmade disasters. (For more information, see the "Range of Public Reactions" section [p. 169].)
- May staff interagency emergency operations centers; deploy personnel; and provide grants, services, and technical assistance to local and state jurisdictions.

National Institutes of Health

(http://www.nih.gov/about/NIHoverview.html)

- Serves as the steward of medical and behavioral research for the nation.
- Conducts science in pursuit of fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to extend healthy life and reduce the burdens of illness and disability.
- Within HHS' National Institutes of Health, the National Institute of Allergy and Infectious Diseases conducts and supports most of the research aimed at developing new and improved medical tools against potential bioterror agents.

Agency for Healthcare Research and Quality

(http://www.ahrq.gov/browse/bioterbr.htm)

- Supports research preparing models and practices that enhance the preparedness efforts of local, state, and national jurisdictions.
- Develops and assesses alternative approaches that ensure health surge capacity for mass casualty events.
- Develops and assesses alternative uses of information technology and electronic communication networks, protocols, and technologies to enhance interoperability among health care systems, the public health system, and other organizational participants in the emergency response network.
- Assesses training and information needs of health care providers for enhanced emergency response.

Administration on Aging

(http://www.aoa.gov/about/over/over_mission.asp)

- Assists a nationwide network of organizations focused on the needs of older Americans in emergency preparedness and response to disaster events related to weather, terrorism, and other catastrophies that adversely affect the lives of and service delivery system for older persons.
- Works with state and area agencies on aging, tribal organizations, and aging service providers in partnering with emergency preparedness systems to assure that the special needs of the elderly are included in emergency planning and response management.

Administration for Children and Families

(http://www.acf.hhs.gov/programs/orr/partners/hthcoord.htm)

- Manages resettlement for domestic refugees and entrant resettlement through the Office of Refugee Resettlement.
- Provides services including resettlement, medical assistance, and social service programs.

COORDINATION OF THE FEDERAL RESPONSE

The federal response to Incidents of National Significance will be coordinated under the National Incident Management System (NIMS) and the NRP. These two documents utilize the principles of the Incident Command System (ICS). This system provides a means to coordinate the efforts of individual agencies as they work toward the common goal of stabilizing an incident and protecting life, property, and the environment.

ICS was developed by the fire and rescue community in the 1970s in response to a series of major wildland fires in southern California. It is the model tool for command, control, and coordination of a complex response situation and has been used by first responders for many years.

ICS principles include the use of:

- Common terminology
- Modular organization, enabling expansion and contraction
- Integrated communications with common plan, procedures, etc.
- Unified command structure, with a common set of objectives and strategies and consolidated action planning among different agencies
- A manageable span of control of personnel and material resources
- Comprehensive resource management, to maximize resource use

NIMS provides the framework for interoperability and compatibility that will, in turn, enable a diverse set of public and private organizations to conduct well-integrated and effective incident management. More detailed information on NIMS can be found at http://www.fema.gov/nims/.

COMMUNICATING WITH THE INCIDENT COMMAND STRUCTURE

The Joint Information System provides a structure for coordination of public communication. Each federal agency will operate its own press operation and will coordinate with the Joint Information Center (JIC) onsite. The JIC does not supplant the federal agencies but provides coordination among the various agencies. The JIC also includes local and state entities, as applicable.

The primary JIC will be authorized to release general medical and public health response information. Other JICs may also release general medical and public health response information to the public at the discretion of the lead public affairs officer.

PUBLIC HEALTH SOURCES OF AUTHORITY

At the federal level, there are several main sources of legal authority related to public health emergencies. Two of the most important of these sources are described in more detail in this section. The federal government also often has legal jurisdiction in situations involving multiple states and other countries. However, it is important to note that many important laws related to public health emergencies are also enacted at state and local levels. For example, all levels of government have the legal authority to issue isolation and quarantine orders, but the authority shifts based on geographic details of the outbreak. Because the state laws vary greatly in

general and need updating to reflect current threats and community needs, many states are currently working on revising their public health laws. Some of the important issues being addressed by states include privacy and protection, clarity of jurisdiction, and liability.

*Public Health Service Act**

(http://www.fda.gov/opacom/laws/phsvcact/phsvcact.htm)

The Public Health Service Act authorizes the Secretary of HHS, acting at both the department level and through agencies of the Public Health Service (e.g., CDC, the Food and Drug Administration, the National Institutes of Health, the Health Resources and Services Administration, the Substance Abuse and Mental Health Services Administration, and the Indian Health Service) to protect the public well-being and provide public health and medical services during emergencies. Under the Public Health Service Act, 42 U.S.C. § 241 et seq., the Secretary is authorized to take the following actions, among others:

- Declare a public health emergency and take appropriate discretionary actions to respond to the emergency
- Act to prevent the introduction, transmission, and spread of communicable diseases
- Deploy the Public Health Service Commissioned Corps
- Develop and stockpile countermeasures, such as antibiotics, chemical antidotes, antitoxins, and medical material, to agents that could be used in a bioterror event

Public Health Security and Bioterrorism Preparedness and Response Act of 2002

(http://thomas.loc.gov/cgi-bin/query/z?c107:H.R.3448.ENR:)

This Act authorizes HHS' Secretary to further develop and implement a coordinated strategy for carrying out health-related activities to prepare for and respond effectively to bioterrorism and other public health emergencies. Among its provisions it requires:

- Assistance to state and local governments
- Extensive training and coordination to prepare for responses to an emergency
- The development and maintenance of the Strategic National Stockpile
- Awards to improve state, local, and hospital preparedness
- Enhanced control of certain biological agents and toxins
- Enforced protection of the food and drug supply

In addition to these authorizations in the Public Health Service Act and the Public Health Security and Bioterrorism Preparedness and Response Act of 2002:

- A section of the Social Security Act provides authorization for waiver of Medicare, Medicaid, or State Children's Health Insurance Program requirements in an emergency.
- Sections of the Federal Food, Drug, and Cosmetic Act provide authorization to inspect and investigate food that may be adulterated, to refuse imports suspected of being adulterated, and to detain or seize any adulturated food introduced into interstate commerce.

Descriptions of selected sections of the Public Health Service Act; the Public Health Security and Bioterrorism Preparedness and Response Act of 2002; the Social Security Act; and the Federal Food, Drug, and Cosmetic Act can be found in appendix D (p. 234).

* Summarized sections include amendments made by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 and the Homeland Security Act of 2002.

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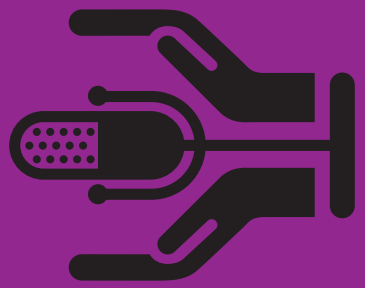

SELF-CARE FOR MEDIA

SELF-CARE FOR MEDIA

GOAL OF THIS SECTION

To provide practical suggestions and tips to promote your safety and well-being while covering a public health emergency.

WHAT THIS SECTION INCLUDES

- **Tips to help you manage the major risks**
- **Recommendations gathered from a variety of organizations for approaches that may help you be better prepared physically and emotionally**

WHAT THIS SECTION DOES NOT INCLUDE

Guidelines are not included for confronting specific public health emergencies.

THE IMPORTANCE AND CHALLENGE OF SAFETY

Reporting on a public health emergency can make your career, but only if you take precautions to make sure that you do not become a victim of the emergency that you are covering. Regardless, the event will prove to be a stressful experience for even the most seasoned professionals. You have probably interviewed crime victims and others who have experienced trauma, but relatively few journalists have worked in an environment devastated by a terrorist attack or profound public health emergency. Adding to the stress and potential danger is the fact that the nature of the threat may be unclear, particularly in the early hours of an emergency.

Many issues complicate reporting during such events, including:

- Physical and mental trauma or "burnout"
- Potential exposure to pathogens, poisons, and other health threats
- The challenge of covering a story when you and/or your loved ones are part of the "affected public"
- Individual distress responses that may manifest as irritability, depression, anxiety, or other posttraumatic stress symptoms (see "Distress Responses" box)

The large scale of a public health emergency almost certainly means there is a limitless amount of work to do, and you may feel the need to push yourself beyond your usual limits. It can be difficult to leave the scene and go home or to take a break. But it is important for you to monitor your needs and well-being so you will be able to stay focused.

What you do in your role as a reporter may have as much impact on public safety as those providing medical assistance. Therefore, it is very important to ensure your physical safety and well-being.

DISTRESS RESPONSES

Distress responses are virtually universal when confronting trauma and usually resolve over time. In some cases, they may persist and interfere with personal relationships; impair functions; cause suffering; or develop into psychiatric disorders, such as post-traumatic stress disorder (PTSD), major depression, substance abuse, phobias, or other anxiety disorders. Distress can also manifest as irritability, social withdrawal, new onset or exacerbation of physical illness, and changes in behavior or personality. Editors, producers, and colleagues should keep an eye out for these persisting signs so that an affected journalist (or other members of the news team) can be offered help.

SELF-CARE DURING THE EMERGENCY

PHYSICAL CARE

Personal Safety Policies

When breaking news of a suspected terror attack occurs, you will want to protect your personal safety as much as possible while covering the story. Because policies and procedures for sending media staff into hazardous situations vary from newsroom to newsroom and bureau to bureau, you may want to become familiar with policies in your workplace.

Standards of Safety

Policies and standards for protecting media personnel, both in the newsroom and in the field, are evolving rapidly in the wake of September 11 and the 2001 anthrax attacks. Both the International Federation of Journalists and the International News Safety Institute have published safety codes for journalists facing danger in covering assignments. These codes, developed by more than 100 media organizations and journalistic associations, suggest standards for journalist safety. Among other provisions, both codes urge news organizations to consider safety first, before competitive advantage, for journalists in dangerous environments. Although originally designed for journalists covering wars and civil emergencies overseas, much of this guidance may also be useful at home during a terrorist attack or other public health emergency.

The box on page 160 presents 11 steps for personal safety, which have been gathered through a review of safety tips from a variety of organizations, such as the International News Safety Institute, the Committee to Protect Journalists (CPJ), and the American Press Institute.

Working In Teams

You may want to consider working with a partner or a group, if possible, when out in the field. Some situations may require putting aside competitive pressures and instead collaborating with other media personnel to increase security. In addition, your teammates should be aware of your movements and able to alert others if a situation arises. CPJ recommends making sure that at least one person, preferably a supervising editor, knows where you are, with whom you are meeting, and when you will return (CPJ 2003).

Personal Protective Equipment

Media professionals who work in areas where biological or chemical agents of terrorism may have been in use face particular dangers. Some newsrooms have purchased "escape hoods" for the employees in their offices, while others have outfitted most of their news vehicles with full biochemical protection suits. Still, other news organizations have, after careful consideration, decided against issuing biochemical suits, concluding that they may give a false sense of security.

Training and practice are crucial for using protective gear. For example, according to the U.S. Army Medical Research Institute of Infectious Diseases' Medical Management of Biological Casualties Handbook, a complete biochemical protection suit

CARRYING IDENTIFICATION AND OTHER INFORMATION

TIP

CPJ recommends ensuring that all personal identification is secure but accessible, along with required press credentials and any personal medical alert emblems. In some situations, copies of vaccination records should be carried as well.

(CPJ 2003)

PROTECTING IMPORTANT DOCUMENTS

TIP

Keep these records in a waterproof, portable container:

- **Will, insurance policies, contracts, deeds, stocks and bonds**
- **Passports, social security cards, immunization records**
- **Bank account numbers**
- **Credit card account numbers and companies**

Note: You may also want to keep copies of these documents in a safe location outside of your home or workplace.

Most news organizations agree … that issuing protective gear is not for the purpose of outfitting reporters and crews to go into a hazardous situation, but rather to protect them and allow them to get out of danger.

– "Girding For Terror"
American Journalism Review, April 2003

“I JUST TRY TO TELL PEOPLE TO STAY SAFE.

I may not always know the short-term or long-term effects of the story—or even the competitive aspects of the story. But I do know how it will affect this newsroom if they are not here tomorrow.”

Angie Kucharski, vice president of news and station manager, KCNC-TV, Denver, CO
From an interview about her staff and its coverage of Colorado’s historic wildfires in 2002.

TABLE 1: SAFETY AND THE STORY—11 STEPS FOR PERSONAL SAFETY

1. Be physically and mentally prepared for the situation you will be facing on assignment. It may be advisable to enroll in a biohazards hostile-environment course that includes basic first aid training before your assignment in a biohazardous situation.
2. If you are going into a physically risky situation, make sure to take a well-known, frequently used travel route.
3. If you have to make a road trip into a dangerous area, you might consider taking two vehicles, so that you will have a backup in case something goes wrong with one of them.
4. It is almost always wise to buddy-up with another correspondent for mutual protection when traveling into a hazardous location.
5. Let someone you can count on know when you are leaving and when you expect to return, and have him or her get word to the office if you do not get back in time.
6. If the situation at a hazardous site suddenly turns explosive, make sure you have figured out an escape route and how to flee as soon as possible. It is a good idea to park a car with nothing blocking its escape.
7. If you have a biohazard suit, it is important for you to know that it takes a minimum of 10 minutes to unpack the suit from its vacuum-sealed container. If you think that you may be in danger of sudden exposure, it may make sense to repack your suit into a sealed plastic bag.
8. Keep emergency phone numbers at hand, programmed into mobile phones, with a key (24/7) contact number on speed dial, if possible. Know the location of hospitals and their capabilities.
9. It is always a good idea when covering a hazardous assignment to review your current vaccination and immunization history. A general practitioner can either advise you on necessary vaccinations or refer you to someone who can provide advice and inoculations. Carry blood-type identification and information on any medical conditions on your person in the field.
10. In any situation that requires covering stories involving viral or bacterial agents, it is even more important than in normal circumstances to wash your hands carefully. Be sure to use good quality soap and plenty of warm water. (The U.S. Department of Health and Human Services’ (HHS) Centers for Disease Control and Prevention (CDC) recommends that you wash for 15–20 seconds.) When soap and water are not available, you can use alcohol-based disposable hand wipes or gel sanitizers.
11. Consider whether there are other ways to get a story. In some cases, it might be possible to cover a story from a safer location.

Sources: American Press Institute 2001; CDC 2004; Centurion Risk Assessment Services Ltd. 2004; CPJ 2003; Franklin 2002; International News Safety Institute 2004b; Paterno 1998

typically consists of a protective mask, full-body overgarment, protective gloves, and overboots. Both the respirators and the oversuits come in a wide range of sizes and must fit properly to be effective. However, this equipment may not fit properly if the wearer has long hair, glasses, or facial hair (Paterno 1998).

Depending on the circumstances of a given situation, a respirator may be used even if a full body suit is not. Respirators and masks come in different types and each type is designed for use against specific kinds of airborne contaminants. Thus, it is critical to choose the right type of respirator for a given purpose. Further, to be effective, a respirator must be used in a total program of proper selection, training, maintenance, and fit testing (to ensure that contaminated air does not leak around the edges of the mask). If you are unsure whether your company has a safety program that would include the use of a respirator, ask your employer.

Among the different types of respirators that you may have heard of are "escape hoods" that are designed to provide short-term protection and are intended only to provide a short amount of additional time (generally 15–30 minutes) to escape from a dangerous situation and move to a safer location. Other types of respirators provide more robust and more prolonged protection against the dangers of inhaling hazardous particles, gases, fumes, dusts, and vapors. You may be familiar with respirators sold in hardware and home improvement stores; the simplest form of these are masks that fit over the nose and mouth and are held in place with an elastic band. Whatever the design, a respirator will be effective only if it has been tested and certified for use against a given type of contaminant and is used as part of a total program of respiratory protection. CDC's National Institute for Occupational Safety and Health provides information to help you understand the purpose and use of respirators (http://www.cdc.gov/niosh/npptl/topics/respirators/factsheets/respfact.html). At the time of an event, public health officials may also provide guidance about the use of masks and respirators, depending on the situation.

STAYING IN TOUCH MEANS STAYING ALIVE.

Staying In Touch

Staying in touch means staying alive. Several people, both in the field and back at the office, should have a list of emergency contacts as well as detailed instructions on how to get in touch with them. Typical communication arrangements for personal security include receiving clearance from a supervising editor before travel, letting associates and editors know arrival and departure times, and checking in with a designated contact on a regular, predefined basis.

TIP

MONITORING SUBSTANCE USE

It is not uncommon for people who typically use alcohol or drugs to increase their use during stressful situations. It is also common for people who are in recovery to start using substances again. People should be cautious of changes in their alcohol and drug use, because use of these substances may impair their ability to work, as well as their judgment, in potentially hazardous environments. These changes in substance use may be an indication of a need for more support. They are usually temporary; however, if the increased use continues, the individual may want to consider seeking professional help.

"WHEN CONSIDERING WHETHER TO ENTER

an area affected by a terrorism event or other public health emergency, journalists should also be concerned about the welfare of their equipment. In many cases it is difficult or impossible to decontaminate electronic equipment. As a result, cameras, audio equipment, and sound trucks could be declared contaminated. In such a situation, the only alternative would be to leave them behind, with unknown chances of recovery."

Vincent T. Covello, Ph.D. director of the Center for Risk Communication

> **"A BUNCH OF OLD FELLAS, MYSELF INCLUDED, ALL SAID,** 'All right, Whew!' Took a deep breath and said, 'Where are we going from here?' I've seen some stuff after 21 years, 22 years. [Reporting on September 11] put me through a whole range of emotions that I never felt before in this business."

Charles Stroble, chief photographer, WBAL-TV, Baltimore, MD
From "Running Towards Danger: Stories Behind the Breaking News of 9/11"

It is also critical that you stay in touch with friends and loved ones during such events. According to Sunny Mindel, former press secretary for Rudolph Giuliani, many first responders felt more focused on their work during the response to September 11 after having checked in with loved ones and letting them know that they were OK.

EMOTIONAL CARE

Taking emotional care of oneself is particularly important in a public health emergency, because you may also be a survivor of the emergency. You may wish to look up the Dart Center for Journalism and Trauma (http://www.dartcenter.org), whose mission includes creating and sustaining partnerships among media professionals, therapists, and others concerned with trauma and encouraging peer support among working journalists. A helpful resource on this site is "Tragedies & Journalists: A Guide for More Effective Coverage," by Joe Hight and Frank Smyth. Even if you did not experience the same kind or degree of trauma as those whom you are interviewing, you may still be coping with the event. Few people who respond to a mass casualty event remain untouched by it. You may experience anxiety, sadness, grief, or anger—but postpone your need for rest and recovery while covering the emergency. This can work up to a point, particularly with practice, but such strategies have their limits, and experts recommend that you develop other psychological coping strategies, such as those described in the following sections ("Setting Boundaries" and "Self-Monitoring"), both for self-care and possibly in support of colleagues. It is most helpful to get together and talk after you have had a hot shower, a few warm meals, and a chance to catch up on sleep.

Setting Boundaries

An important tool in protecting your emotional health during a crisis is one you probably use already in other aspects of your life—setting personal boundaries. By determining these before the crisis occurs, you will be better able to take care of yourself. Personal boundaries require a realistic assessment of your limits and what you need to be effective in covering the event. Keep in mind that it may be harder to maintain personal boundaries in a crisis because you also may have endured the event that you are covering, and this can make it harder to remain emotionally detached. Two examples of personal boundaries that you might set include:

- Setting work hours (e.g., limiting shifts to 12 hours or less after the initial emergency phase of the event).
- Limiting exposure to the event during "off" hours. Although it is natural to want to keep on top of the developments in the story while at home, constant exposure to a traumatic event takes its toll. A study on psychological responses to the events of September 11 indicated that the number of hours of television coverage an individual watched per day in the days following the attacks correlated with his or her development of PTSD or symptoms of clinically significant psychological distress (Schlenger et al. 2002). It is unclear whether this association is actually causal or only correlational (i.e., Does television coverage lead to increased psychological distress, or do those who have more psychological distress seek out more television exposure than those who do not?).

Regardless of the story you are following, it is clear that taking some kind of break from work is important for refueling yourself emotionally and physically. For example, perhaps it's possible to rotate jobs so that you are not constantly on the front line of the disaster.

Self-Monitoring

Even the most seasoned professional needs to be attentive to his or her own stress responses. Continual self-monitoring is an important component in managing stress. Though this may seem obvious, when you are involved in covering a public health emergency, self-monitoring may seem like a luxury. Functioning well will depend on many factors, such as stamina, expectations, prior traumatic experiences, and even eating habits. The way you function in your regular role may be very different from the way you function in a crisis. Therefore, continual self-monitoring is critical to make sure that stress is at a manageable level. You may find it helpful to partner with a colleague ("buddy care"), so that you can help monitor each other's stress levels to determine when relief is needed.

The Self-Monitoring Checklist developed by HHS' Substance Abuse and Mental Health Services Administration (see appendix H [p. 245]) is a useful tool for measuring stress levels during and following a public health emergency. Experiencing a few of the listed symptoms generally does not constitute a problem, but experiencing several symptoms from each category may indicate a need for stress reduction. By taking care of yourself, you will be better able to do your job and, for that matter, to return to "normal" personal functioning after the event.

Excessive Desensitization

A potentially harmful coping mechanism to both the media and the community is the effect of desensitization to others' emotional pain and psychological distress. While it is sometimes possible to compartmentalize your emotions temporarily to get through a difficult period and do what it takes to get a story written, it is harmful to stop feeling altogether or to put away the emotions for too long. You need time and encouragement to process your emotions—to deal with your feelings of sadness, anger, horror, or confusion and not repress them (Bull & Newman 2003).

How can you tell you're becoming desensitized? One sign is projecting negative feelings experienced on the job onto others at home in angry or abusive ways. Sooner or later, compartmentalization, an effective short-term coping mechanism, breaks down. "Walling off one's feelings" may even hinder a reporter's ability to cover the story, because his capacity for empathy has been diminished. Reporters who retreat into an emotional shell may find it painful to build rapport with and listen to others who have experienced alarming or tragic circumstances.

Talking With Others

Making mental health services readily available for those who need them has proved helpful after many community tragedies. This may be a particularly good strategy for media employers to use in providing support for their journalist employees. However, the benefits of the common practice of group debriefings (voluntary or mandatory and whether facilitated by a certified professional or not) has been debated. (Institute of Medicine of the National Academies 2003; National Institute of Mental Health 2002).

> **"THERE IS A FEAR IN NEWSROOMS** of being labeled as weak or unable to do a story. Culturally, journalists need to realize that they are entitled to grieve."
>
> *David Handschuh, photographer, New York Daily News*
>
> *From an interview reflecting on the severe physical injuries and emotional stress he experienced as a result of covering the attack on the World Trade Center in New York City on September 11, 2001.*

“YOU RESPOND AND YOU KEEP DOING YOUR JOB.

And I think because you become so focused, that’s where [it becomes] easy for a lot of people who do what we do to sort of compartmentalize and focus, and not realize ... the effect of how a tragedy might hit them.”

Angie Kucharski, vice president of news and station manager, KCMC-TV, Denver, CO

From an interview about her and her colleagues’ experiences covering the Columbine High School shootings and their aftermath in 1999.

Organizations may find it helpful to offer mental health services to their employees (e.g., through an Employee Assistance Program) and to create an environment that supports seeking these kinds of services when needed. A mental health consultant or counselor can also serve as a resource for disaster mental health questions and can provide names of professionals with expertise in particular areas.

The Institute of Medicine’s Committee on Responding to the Psychological Consequences of Terrorism further noted that:

> Some workplace environments have a culture that is not conducive to seeking help for psychological issues. Seeking help or publicly sharing fears may be seen as a weakness. Alternative strategies may be necessary in such cases. An easily accessible anonymous service outside the workplace may be preferable to ensure confidentiality, and initiatives, such as group debriefings, may be less useful (Institute of Medicine of the National Academies 2003).

It is important for employers to de-stigmatize the act of seeking mental health support so that everyone can feel comfortable accessing these services. Peer support is also beneficial. Often there are individuals in media organizations whom troubled employees can seek out for empathy and friendly counsel. The persons providing this counsel, however, need to be careful not to become overwhelmed by others’ emotional pain (Bull & Newman 2003).

SELF-CARE BEFORE THE EMERGENCY

Making preparations before you get an assignment to cover terrorism or another public health emergency can make a big difference in your physical and emotional health when the time comes. Fortunately, recommendations have been developed by professional societies, news organizations, and journalists for actions that can protect you from injury or illness in those stressful times. The following are some considerations as you start to plan for an emergency event and determine whether you’re ready:

- **Management structure and support.** Is your media organization prepared to respond to a public health emergency? Has there been special training/education in disaster reporting?
- **Social support.** Do you have a strong support network of peers, friends, and/or family to count on?
- **Competing demands.** Do you have family responsibilities to deal with? Are there ways to plan ahead of time to meet those responsibilities?
- **Physical health.** Do any health considerations limit your ability to work in certain conditions or environments? Do you have a lot of stamina? Do you take care of yourself when under stress, or do you tend to get sick or experience stress levels that interfere with getting your job done? Do you take any medications?
- **Prior traumas.** Have you experienced prior traumas of any sort (e.g., disasters, accidents, abuse, sexual assault) or the recent death of a loved one? Will certain situations have personal significance due to prior experiences? (Note: Prior traumas or losses may make coping with a dramatic health emergency more difficult for some people but easier for others. You will need to decide for yourself whether to get involved, based on whether you have resolved the emotional issues surrounding the earlier trauma or grief.)
- **Prior mental health issues.** Do you have any past mental health issues that may affect your adjustment or functioning in a disaster setting?

MAKING PERSONAL PREPARATIONS

Only you can decide how close you get to the actual disaster scene and whether you will interview survivors. These decisions depend on you knowing yourself, including your reactions and limitations. Whether you do this kind of work or you simply know that such an assignment may come your way, you can help yourself adjust to working in a disaster setting by taking the following steps in advance:

- **Make arrangements for personal responsibilities.** Confidence and security in the field begin with the sense of well-being that comes from knowing that plans are in place for those you love. If you have children, elderly parents, financial responsibilities, or other personal demands that may compete for your attention during a disaster, you might want to try to make arrangements ahead of time. Information on how to prepare a Family Disaster Plan can be found in appendix E (see p. 239).
- **Create a self-care plan.** You may want to consider how you will take care of stress and your health while doing disaster work.
- **Participate in drills and other disaster training.** Although training can never completely simulate a disaster, it can help prepare you for some of the issues that may arise in a disaster setting. Some larger news organizations have enrolled their front-line reporters, editors, and photojournalists in "hostile-environment training" programs or safety courses tailored for journalists. The central focus of such courses is to improve knowledge and security awareness skills so that journalists can avoid life-threatening situations in the field. A variety of American and international companies offer security, first aid, and emergency response training as well as biological, chemical, and nuclear weapons training. Consider approaching local emergency management and public health agencies involved in planning and response for these events to explore whether you can participate in their training exercises. The benefit to the media is that such participation helps media understand local response procedures and build relationships with local public health officials and first responders. Media participation is helpful to officials as it can help test risk communication strategies. You may be more successful in gaining participation if you agree not to cover the exercises as a story but as a true participant.
- **Work with employers to make workplace preparations.** You can work with your managers and colleagues to develop emergency response plans and discuss the details of how work will change during an emergency (e.g., whether managers will reassign regular work, change shifts).
- **Ensure that your employer has a plan for providing psychological support.** This support, which may be needed during and after such an event, may be offered through Employee Assistance Program staff or contracted specialists. Assistance should be confidential to assure journalists that access to help will not harm their careers.
- **Assemble a disaster supplies kit for home and workplace.** If you need to evacuate your home or office or need to shelter in place, having some essential supplies on hand will make you feel more comfortable. You should consider preparing a disaster supplies kit in an easy-to-carry container, such as a duffelbag or small plastic trash can. (More information on disaster supplies can be found in appendix F [see p. 241].) The American Red Cross recommends that copies of essential documents—powers of attorney, birth and

> **"I CONTINUE WITH THERAPY AND WORK** through some of the issues of September 11. There are many, many newspapers and television stations that offer employee assistance programs. That's a good thing; however, it's reactive, rather than proactive. You as the person who responds to an event have to seek them out. And while many of them do a very, very excellent job ... many of these employee assistance programs aren't trained to deal with traumatized journalists."
>
> *David Handschuh, photographer, New York Daily News*
>
> *From an interview reflecting on the severe physical injuries and emotional stress he experienced as a result of covering the attack on the World Trade Center in New York City on September 11, 2001.*

marriage certificates, insurance policies, life insurance beneficiary designations, and a copy of your will—should also be kept in a safe location outside the home. A safe deposit box or the home of a friend or family member in a different town is a good choice. (More information on preparing a workplace disaster supplies kit can be found in appendix G [see p. 243].) Additional supply checklists can also be found at http://www.ready.gov.

SELF-CARE AFTER THE EMERGENCY

As the coverage of the event starts winding down, it is important to continue monitoring your behavioral, psychological/emotional, physical, cognitive, and social functioning, especially if you are experiencing challenges returning to your normal routine. Tips for reducing stress and renewing energy, developed by HHS' Substance Abuse and Mental Health Services Administration, can be found in appendix I (see p. 246).

There may be times when stress reduction strategies are not helpful enough. Research has shown that some changes associated with exposure to trauma may involve a change in brain chemistry and function. Antidepressants can be useful in reducing both PTSD and depression (Bull & Newman 2003). Cognitive-behavioral treatment models have also been shown to be effective for these disorders. The Disaster Mental Health Institute at the University of South Dakota provides the following guidelines (Jacobs 2003), which may help you decide if your reactions may require professional assistance:

- When disturbing behaviors or emotions last more than 4–6 weeks
- When behaviors or emotions make it difficult to function normally (including functioning at work or in the family)
- Any time an individual feels unstable or concerned about his or her behavior or emotions

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RANGE OF PUBLIC REACTIONS

10

RANGE OF PUBLIC REACTIONS

GOAL OF THIS SECTION

To provide insight into the public's range of posttraumatic reactions to terrorism and other public health emergencies so that the media better understand their audiences.

WHAT THIS SECTION INCLUDES

- **Information about the ripple effect of terrorism, factors that may influence individual reactions to a traumatic event, the range of reactions, and the phases of recovery**
- **Information adapted from the field of disaster mental health, which has focused mostly on reactions to natural events**

WHAT IS NOT INCLUDED AND WHY

Reactions to specific categories of events or by specific audiences are not included because it is difficult to predict how audiences will react to specific events. There is little data or research on this issue.

IMPACT OF TERRORISM

PANIC RARELY OCCURS

What happens when the unthinkable strikes? Will we see the typical Hollywood depiction of a disaster scene—people screaming, stampeding, rioting? Will the general public be irrational, uncoordinated, and uncooperative? Probably not. A study of responses to disasters shows a pattern of mostly helpful and adaptive behaviors by the public (Glass & Schoch-Spana 2002). The most recent experiences with the public's reactions to September 11 provided more such evidence. For example, people evacuating the World Trade Center towers went out of their way to help disabled people get down the stairs. People have a wide range of reactions, as described in this section, but panic is not a common one.

Fear should not be misunderstood or mislabeled as panic. In fact, fear is a normal and often appropriate response to very frightening circumstances. A more complete discussion about fear can be found in the essay by Dr. Peter Sandman at the end of the "Risk Communications During a Terrorist Attack or Other Public Health Emergency" section (see p. 183).

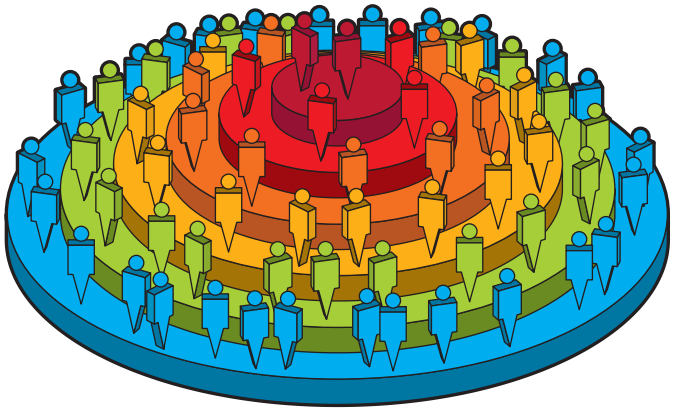
Panic is not only rare but also preventable when timely and accurate information, which includes personal protective measures, is released to the public (Glass & Schoch-Spana 2002). The media play a critical role in helping public officials disseminate needed information. By doing so, the media not only help mitigate potential panic reactions but also help harness the capacities of the public to constructively participate in disaster response.

RECOGNIZING THE RIPPLE EFFECT

Terrorism is primarily a psychological assault that erodes our sense of safety and sense of security, two of the most basic human needs. The physical impact of a terrorist or other public health emergency involving mass trauma and casualties is concrete and visible. The psychological impact, however, is much more subtle in nature, sending waves of shock and distress throughout the community, the state, and the nation. As such, the psychological suffering from an act of terrorism is usually more extensive than the physical injuries (Institute of Medicine of the National Academies 2003).

Some experts use what is called the population exposure model (DeWolfe, In press) to depict the emotional impact that mass violence has on various victims, families, responders, and community groups. In essence, the psychological impact of the event ripples out from those immediately affected, such as victims and their family members, through the community beginning with rescue workers who are exposed to tremendous suffering and other service providers who deal directly with

FIGURE 10–1: EMOTIONAL IMPACT OF A MASS VIOLENCE OR TERRORISM EVENT (Population Exposure Model)[1]



- Seriously injured victims; bereaved family members, loved ones, close friends
- Victims with high exposure to trauma; victims evacuated from the disaster
- Bereaved extended family members and friends; rescue and recovery workers with prolonged exposure; medical examiner's office staff; service providers directly involved with death notification and bereaved families
- People who lost homes, jobs, pets, valued possessions; mental health providers; clergy, chaplains, spiritual leaders; emergency health care providers; school personnel involved with survivors; families of victims; media personnel
- Government officials; groups that identify with the target victim group; businesses with financial impacts
- Community at large

Note: This diagram is based on the "Population Exposure Model."

[1] DeWolfe, D.J. (Ed.). (In press). *Mental health response to mass violence and terrorism: A training manual*. Rockville, MD: Center for Mental Health Services, Substance Abuse and Mental Health Services Administration, U.S. Department of Health and Human Services.

REDUCING PANIC WITH INFORMATION

By Vincent Covello, Ph.D.

The disaster research literature indicates that panic rarely occurs. The degree to which these general findings apply to a bioterrorist attack, however, is debatable. Panic may be more of a risk following a bioterrorist attack using contagious, dreaded, or lethal organisms, such as pneumonic plague or smallpox.

Panic describes an intense contagious fear causing individuals to think only of themselves. The risk factors for panic include:

- **The belief that there is a small chance of escape**
- **Perceiving oneself at high risk of being injured or killed**
- **Available but limited resources for assistance**
- **Perceptions of a "first come, first served" disaster management system**
- **A perceived lack of effective disaster leadership and management**
- **Loss of credibility by authorities**

The chance of panic occurring is even further reduced when people receive:

- **Clear, brief, and consistent information**
- **Frequent information from trusted and credible leaders who are highly visible**
- **Meaningful tasks that increase group interaction, increase connectedness, and provide a sense of control**

The assumption that people will immediately panic or behave irrationally following a disaster can have negative consequences. Authorities may provide inaccurate information or unfounded reassurance motivated by a wish to calm the public. The desire to avoid panic may also lead authorities to miss opportunities to engage the public in managing the disaster.

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RESPONSES TO TRAUMA
September 11 Example

For every person who is physically harmed, many more are likely to experience psychological and emotional effects. As a matter of fact, most people will experience some psychological distress following a terrorist attack. Immediately following September 11, a survey of more than 3,500 New York City Metropolitan area residents found that 75 percent reported having problems attributed to the attacks, while only 35 percent reported being or knowing a victim. The study also found that:

- **49 percent participated in religious or community memorial services.**
- **48 percent experienced anger.**
- **37 percent experienced worry.**
- **21 percent of smokers increased smoking.**
- **12 percent of respondents with problems received help. Family members (36 percent) and friends or neighbors (31 percent) were the main source for help.**
- **3 percent increased drinking.**

(Centers for Disease Control and Prevention 2002)

family members, such as medical examiner staff and recovery workers. The next ripple touches those who support members of the community, such as clergy, spiritual leaders, mental health providers, and journalists, who are all repeatedly immersed in the details of the situation. The next ripple touches the officials who are managing the situation, including government officials, and businesses that are financially impacted, and the ripple effect then continues through the national community. Figure 10–1 illustrates this concept.

FACTORS THAT INFLUENCE INTENSITY OF REACTIONS

In an emergency, stress reactions often surface after people have grappled with their immediate physical situations. The intensity of the reaction is determined by the magnitude of the disaster, the level of trauma experienced, and individual coping and stress management abilities. The intensity of the reaction may also be influenced by certain characteristics of the emergency, such as:

- Threat to life
- Severe physical harm or injury
- Receipt of intentional injury or harm
- Exposure to images of the grotesque
- Violent or sudden loss of a loved one
- Witnessing or learning of violence toward a loved one
- Exposure or fear of exposure to a noxious agent
- Intentional death or harm caused by others
- A large number of deaths, especially the deaths of children

In addition, people experience emergencies through their own individual lenses. The meaning that a person assigns to the emergency, his or her personality, and his or her world view and spiritual beliefs contribute to how each person will perceive, cope with, and recover from the event (DeWolfe 2000).

RANGE OF REACTIONS

Terrorism and traumatic events activate the body's survival response, i.e., fight, flight, or freeze. People who are exposed to terrorism and traumatic events may experience a variety of reactions. These responses may be very different from reactions they have had to other stressful events in their lives in the past, and that difference itself can be unsettling and even frightening. Nevertheless, the majority of people's reactions are ordinary reactions to extraordinary events.

For most people, the return from crisis to the resumption of everyday activities and the resolution of stress reactions is an automatic process requiring little or no intervention other than "tincture of time." But for others, the return to a regular routine is much more challenging. It is very difficult to predict which individuals will have a difficult time recovering from a particular event. Any person, regardless of existing coping skills or psychological strength, may be particularly moved by a specific event. This is a sign of being human, not of being weak.

On the following page are some reactions common to people who experience traumatic stress. Although these cognitive, emotional, behavioral, and physical reactions can be upsetting, they are normal reactions to extreme stresses (Jacobs 2003).

COGNITIVE REACTIONS

- Having recurring dreams and nightmares about the event and its aftermath
- Reconstructing in one's mind the occurrences surrounding the event itself, in an effort to make it play out differently
- Having difficulty concentrating or remembering things
- Questioning one's own spiritual or religious beliefs
- Having repeated thoughts or memories of loved ones who died or the damage that resulted from the event that are hard to stop

EMOTIONAL REACTIONS

- Feeling numb, withdrawn, or disconnected
- Feeling frightened or anxious when sounds or smells remind one of the event
- Feeling a lack of involvement or enjoyment in everyday activities
- Feeling depressed, blue, or down much of the time
- Feeling bursts of anger or intense irritability
- Feeling a sense of emptiness or hopelessness about the future

BEHAVIORAL REACTIONS

- Being overprotective of one's own safety and one's family's safety
- Isolating oneself from others
- Becoming very alert at times and startling easily
- Having problems getting to sleep or staying asleep
- Avoiding activities that remind one of the event or its damage; avoiding places or people that bring back memories
- Having increased conflict with family members
- Keeping excessively busy to avoid thinking about the event
- Being tearful or crying for no apparent reason

PHYSICAL REACTIONS

- Stomach upset and nausea
- Diarrhea and intestinal cramps
- Elevated heart rate
- Elevated blood pressure
- Elevated blood sugar

A person experiencing any of these reactions may need to seek assistance from a mental health or medical professional if the reaction interferes with daily functioning. In addition, the following reactions may indicate the need for medical intervention or a mental health evaluation:

- Disorientation—dazed; memory loss; inability to cite the date, time, or state in which one lives, recall events of the past 24 hours, or understand what is happening
- Inability to care for oneself (not eating, bathing, or changing clothes); inability to manage the activities of daily living
- Suicidal or homicidal thoughts or plans
- Problematic use of alcohol or drugs
- Domestic violence, child abuse, or elder abuse

FLASHBACKS

Sometimes people exposed to trauma may experience a "flashback," which may be triggered by a sight, sound, or smell that reminds them of the event. Flashbacks are much more than just intrusive and unwanted memories. In a flashback, for a few seconds the person feels as if he or she is back in that traumatic moment again. Flashbacks can be so real that people can see all the colors, hear all the sounds, and even smell all the smells—just as if the moment were happening again. People who experience flashbacks and are unfamiliar with them sometimes fear that they are having a psychotic breakdown. Flashbacks can be fairly common, however, and generally become less frequent with time until they disappear altogether. If flashbacks persist after an event or increase in frequency, the flashback sufferer may find professional mental health support beneficial.

PHYSICAL EFFECTS OF STRESS

Numerous studies have found that trauma has negative effects on physical health. This appears especially true for those suffering from posttraumatic stress disorder. People who are exposed to traumatic events may be at increased risk not only for posttraumatic stress disorder but also for major depression, panic disorder, generalized anxiety disorder, and substance abuse. They may also have physical illnesses, including hypertension, asthma, and chronic pain syndromes (Yehuda 2002). One study found that adults who reported traumatic experiences as children had higher rates of serious medical conditions, including cancer, heart disease, and chronic lung disease (Felitti et al. 1998).

> **"THE AIM OF TERROR IS TO BREAK A SOCIETY'S RESOLVE,** to separate a society from its traditional values, to cause it to break internally. The result of ongoing terror is that people in Northern Ireland have experienced rising rates of alcoholism, domestic violence, suicide, smoking, drug abuse, and a general hollowing out of society. The violence has stopped, but we still don't know how deeply the poison has run."
>
> *Conor Brady, former editor of The Irish Times*
> *From Reporting on Terrorism: The News Media and Public Health*

CHILDREN AND ADOLESCENTS

Children process information, and experience and express emotions, differently than adults. A child's reaction to disasters, violence, and the sudden death of loved ones is dependent on that child's psychological development, life and family situation, and critical caretaking relationships (DeWolfe, In press). Terrifying events can cause overwhelming and unfamiliar physical and emotional reactions that can traumatize children.

Children have a difficult time deciding what is fact and what is fantasy, which leads to fear and confusion. When trying to make sense of what has happened, children often blame themselves for causing or worsening an incident, which can lead to feelings of guilt and shame.

Very young children depend on a stable environment and reliable people to take care of them. As children become older, they may try to understand why the event happened and what will happen next. Family, significant adults, pets, playmates, school, and the neighborhood are important features in a child's world. When a public health emergency takes place in a community, many of these significant features may be disrupted or destroyed. Table 1, on the following page, provides more information on the behavioral, physical, and emotional symptoms children at different ages may experience.

Some youngsters are more vulnerable to trauma than others, for reasons scientists do not fully understand. It has been shown that the impact of a traumatic event is likely to be greatest in the child or adolescent who previously has been the victim of child abuse or some other form of trauma or who already has a mental health problem (National Institute of Mental Health 2001).

OLDER ADULTS

Older adults may in some ways be uniquely resilient to the grief and trauma of acts of terrorism. The wisdom and experience accrued over a lifetime can provide tools to help cope with loss, changes, and painful emotions. As older adults become more physically frail or develop significant health problems, however, their reactions to terrorism can be greatly affected by their physical needs. When an older person is already feeling vulnerable due to changes in health, mobility, and cognitive abilities, the feelings of powerlessness and vulnerability that result from a terrorist event can be overwhelming. Sudden evacuations from nursing or residential facilities can be disorienting and confusing. Sensory impairment may cause older adults to be unresponsive to offers of help. Below are other ways that older adults might be affected:

- Overwhelming grief after losing children or grandchildren
- Fear after losing children who were their primary caretakers
- Distress over having to step in to care for a child whose parents have died (can be intensified as older adults worry about changing their lifestyle and making sure there is enough money to care for an extra person in the household)
- Memories of combat that could be stirred up in war veterans

TABLE 1. CHILDREN'S AND ADOLESCENTS' REACTIONS TO TRAUMA

AGE	BEHAVIORAL SYMPTOMS	PHYSICAL SYMPTOMS	EMOTIONAL SYMPTOMS
1–5	• Clinging to parents or familiar adults • Helplessness and passive behavior • Resumption of bed-wetting or thumbsucking • Fear of the dark • Avoidance of sleeping alone • Increased crying	• Loss of appetite • Stomach aches • Nausea • Sleep problems, nightmares • Speech difficulties	• Anxiety • Generalized fear • Irritability • Angry outbursts • Sadness • Withdrawal
6–11	• Decline in school performance • School avoidance • Aggressive behavior at home or school • Hyperactive or silly behavior • Whining, clinging, or acting like a younger child • Increased competition with younger siblings for parents' attention • Traumatic play and reenactments	• Change in appetite • Headaches • Stomach aches • Sleep problems, nightmares • Somatic complaints	• Fear of feelings • Withdrawal from friends and familiar activities • Fear triggered by reminders of the event • Angry outbursts • Preoccupation with crime, criminals, safety, and death • Self-blame • Guilt
12–18	• Decline in school performance • Rebellion at home or school • Decline in previous responsible behavior • Agitation or decrease in energy level; apathy • Delinquent behavior • Risk-taking behavior • Social withdrawal • Abrupt shifts in relationships	• Change in appetite • Headaches • Stomach aches • Skin eruptions • Complaints of vague aches and pains • Sleep problems, nightmares	• Loss of interest in peer social activities, hobbies, recreation • Sadness or depression • Anxiety and fearfulness about safety • Resistance to authority • Feelings of inadequacy and helplessness • Guilt, self-blame, shame, and self-consciousness • Desire for revenge

Source: DeWolfe, D.J. (Ed.). (In press). *Mental health response to mass violence and terrorism: A training manual*. Rockville, MD: Center for Mental Health Services, Substance Abuse and Mental Health Services Administration, U.S. Department of Health and Human Services.

TABLE 2. OLDER ADULTS' REACTIONS TO TRAUMA

BEHAVIORAL SYMPTOMS	PHYSICAL SYMPTOMS	EMOTIONAL SYMPTOMS
• Withdrawal and isolation • Reluctance to leave home • Relocation adjustment problems	• Worsening of chronic illnesses • Sleep disorders • Memory problems • Somatic symptoms	• Feeling overwhelmed and shutting down • Depression • Despair about losses • Apathy • Confusion, disorientation • Suspicion • Agitation, anger • Fears of institutionalization • Anxiety with unfamiliar surroundings • Embarrassment about receiving "handouts"

Source: DeWolfe, D.J. (Ed.). (In press). *Mental health response to mass violence and terrorism: A training manual*. Rockville, MD: Center for Mental Health Services, Substance Abuse and Mental Health Services Administration, U.S. Department of Health and Human Services.

In addition, certain vulnerabilities that are more common among older adults may heighten reactions and/or interfere with recovery. These include:

- Mobility limitations
- Susceptibility to hypothermia and hyperthermia
- Physical and sensory (sight, hearing) limitations

Table 2 provides some of the symptoms that older adults may experience in reaction to a traumatic event.

RESILIENCY-BUILDING (AND STRESS-RELIEVING) RECOMMENDATIONS

Following are some of the recommendations that media may hear from mental health and public health professionals during these times. Helping community members cope with the impact of terrorism and return to regular routines is an important part of the public health message and is likely to become a part of the story in the days and weeks after an act of terrorism.

THINGS TO REMEMBER WHEN TRYING TO UNDERSTAND DISASTROUS EVENTS

(Substance Abuse and Mental Health Services Administration 2003)

- Few people who see a disaster are untouched by it.
- It is normal to feel anxious about your and your family's safety.
- Profound sadness, grief, and anger are ordinary reactions to an extraordinary event.
- Acknowledging our feelings helps us recover.
- Focusing on our strengths and abilities will help us heal.
- Accepting help from community programs and neighbors is healthy.
- We each have different needs and different ways of coping.
- It is common to want to strike back at people who have caused great pain, but it is important not to extend these feelings toward people who merely look like those who perpetrated an act of terrorism. Nothing good is accomplished by hateful language or actions.

SIGNS THAT ADULTS NEED ASSISTANCE

If the reactions listed below last longer than a period of 4–6 weeks or impair a person's ability to function normally in day-to-day life, he or she may want to consider speaking to a mental health professional:

- Difficulty communicating thoughts
- Difficulty sleeping
- Difficulty maintaining balance in lifestyle, activities, or schedule
- Frustration triggered easily
- Increased use of drugs or alcohol
- Limited attention span
- Poor work performance
- Headaches or stomach problems
- Tunnel vision or muffled hearing
- Disorientation or confusion
- Difficulty concentrating
- Reluctance to leave home
- Depression, sadness
- Feelings of hopelessness
- Mood swings
- Crying easily
- Overwhelming guilt and self-doubt
- Fear of crowds, strangers, or being alone

WAYS TO EASE THE STRESS

- Talk with someone about your feelings—anger, sorrow, and other emotions—but only if the conversation feels comfortable to you.
- Do not hold yourself responsible for the disastrous event or be frustrated because you feel that you cannot help directly in the rescue work.
- Take steps to promote your own physical and emotional healing by staying active or by adjusting your daily habits. A healthy outlook (i.e., healthy eating, rest, exercise, relaxation, and meditation) will benefit you and your family.
- Maintain a normal household and daily routine and limit responsibilities that are demanding of yourself and your family.
- Spend time with family and friends.
- Participate in memorials, rituals, and symbolic gestures and events as a way to express feelings.
- Use existing support groups of family, friends, and church.
- Establish a family emergency plan. Taking an active role in this way ("doing something") can be very comforting.

If these stress-relieving strategies are not helping, or loved ones are using drugs or alcohol to cope, outside or professional assistance may be needed.

HELPING CHILDREN COPE

(American Red Cross 2001)

Routines. Children of all ages can benefit from the family keeping its usual routines—meals, activities, and bedtimes—as close to normal as possible. This allows a child to feel more secure and in control. As much as possible, children should stay with people with whom they feel most familiar.

Special needs. Accept the special needs of children by allowing them to be more dependent on you for a period of time. Give more hugs if they need them; let them keep the light on at night, have their favorite teddy bear or blanket (even if previously put away), or not sleep alone; accept any clinging behavior.

Media coverage. Following a disaster, everyone is eager to hear the latest news about what happened. Disaster research has shown, however, that unexpected messages or images on television can be frightening to children, causing an appearance of stress-related problems. In addition, anyone who watches a lot of the disaster coverage can become what is called a "secondary victim" and suffer emotional and physical problems. Therefore, experts feel that it is best not to allow children to watch news coverage of the disaster.

Feelings and reactions. Children express their feelings and reactions in different ways. Your acceptance of this will make a difference in how your child recovers from the trauma. This means accepting that some children will react by becoming withdrawn and unable to talk about the event, while others will at times feel intensely sad and angry and will at other times act as if the disaster never happened. Children are often confused about what has happened and about their feelings. However, do not be surprised if some children appear unaffected by what they have seen and heard. Not everyone has immediate reactions; some have delayed reactions that show up days, weeks, or even months later and some may never have a reaction.

Talking About What Happened

- Listen to and accept children's feelings.
- Give honest, simple, and brief answers to their questions.
- Make sure that children understand your answers and the meaning you intend.
- Use words or phrases that will not confuse a child or make the world more frightening.
- Create opportunities for children to talk with each other about what happened and how they are feeling.
- Give your child an honest explanation if you are feeling so upset that you do not want to talk about what happened. You may want to take "time out" and ask a trusted family friend to help talk to the child.
- If children keep asking the same question over and over it is because they are trying to understand—trying to make sense out of the disruption and confusion in their world. Younger children will not understand that death is permanent, so their repeated inquiries are because they expect everything to return to normal.
- If the child feels guilty, ask him or her to explain what happened. Listen carefully to whether he or she attaches a sense of responsibility to some details or circumstances. Explain the facts of the situation and emphasize that no one, least of all the child, could have prevented the tragedy.
- Let the school help. The child's teacher can be sensitive to changes in the child's behavior and may be able to talk to the child in a helpful way.
- Even if you feel the world is an unsafe place, you can reassure your child by saying, "The event is over. Now we will do everything possible to stay safe, and together we can return things to normal."
- Notice when children have questions and want to talk.
- Be especially loving and supportive and willing to talk; children need you at this time.

Certain circumstances may make a child more vulnerable to having difficulty coping with the disaster. If a child has experienced a recent loss, such as a divorce or a death of someone who was close, or has moved to a new neighborhood, he or she may feel particularly overwhelmed. A traumatic event can reactivate the emotions associated with previous traumas, which can be overpowering. Seeing a counselor does not mean that a child is "mentally ill" or that the parents have failed to support him or her. Following a trauma, many adults and children have found that it is helpful to talk with a counselor who has specialized training in posttraumatic reactions and can help them understand and deal with how they are feeling.

More information on helping children and adolescents cope with violence and disaster can be found in appendix J (see p. 247).

COPING WITH DISASTER: TIPS FOR OLDER ADULTS

(National Mental Health Association 2001)

- Talk about the experience and how you are feeling. Expressing your thoughts with others gives you the opportunity to relieve stress, reduce anxiety, and realize that other people share your feelings.
- Communicate with loved ones often. Communicating with family and friends following a disaster helps increase feelings of safety and security.
- Take care of yourself physically. If exercise is a regular part of your routine, continue to exercise. It is also important to eat well, drink plenty of water, and rest.
- Be around others. Isolation and loneliness can increase the degree to which you experience symptoms. If you do not have a local network of family or friends to visit with often, find a place where you can be with people. Volunteer at a

TABLE 3: THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES' MAJOR ACTIVITIES RELATING TO THE PSYCHOLOGICAL EFFECTS OF TERRORISM

The two major agencies within the U.S. Department of Health and Human Services that are working on preparing for the psychological effects of disasters and terrorism are the Substance Abuse and Mental Health Services Administration (SAMHSA), which assists states with funding and training on service delivery, and the National Institute of Health's National Institute of Mental Health (NIMH), which focuses on research. The Centers for Disease Control and Prevention (CDC) is becoming increasingly involved as it examines ways to incorporate mental health into its public health activities. All three agencies work closely together on many initiatives and frequently cosponsor activities. The Health Resources Services Administration (HRSA) also plays a role through terrorism grants administered by CDC and HRSA to the states, which include benchmarks for integration of mental health into public health and hospital preparedness activities.

SAMHSA (http://www.samhsa.gov)

Since 1974, SAMHSA has had a collaborative agreement with the Federal Emergency Management Agency to administer crisis counseling and training assistant programs after presidentially-declared disasters. In 2001, SAMHSA initiated the Child Traumatic Stress Initiative to identify effective treatments and services; collect clinical data on child trauma; develop resources for professionals, consumers, and the public; and develop trauma-focused professional training. SAMHSA has devoted significant resources to helping the states improve their disaster preparedness capacity. In 2003, SAMHSA sponsored a conference, Creating a Roadmap for Disaster Preparedness: Strengthening State Capacity for Disaster Mental Health and Substance Abuse, which was attended by more than 50 states and territories. It was followed up by a series of regional meetings to further develop plans. SAMHSA also awarded 2-year planning grants to 35 states to enhance their substance abuse and mental health service provision in the event of a disaster, such as terrorism.

NIMH (http://www.nimh.nih.gov)

Through its research programs, NIMH conducts and supports mental and behavioral health research relevant to preparation for and response to the psychosocial effects of terrorism and mass emergencies. This research spans and integrates basic science, clinical practice, and health care system issues. Additional research focuses on preventing the damaging effects of traumatic stress through the study of basic mechanisms; detection and diagnosis; treatment and prevention; and education, training, and information resources.

This research contributes to better response planning; training for the health and human services workers; more communication before, during, and after incidents to reduce anxiety or distress and promote compliance with safety procedures; the design and deployment of outreach and intervention programs to reduce symptoms and improve functioning; and the treatment of psychiatric disorders that arise after exposure to mass trauma.

local nonprofit organization, offer to speak at local schools about historical events you have experienced, contact local churches or senior centers to see if they are holding any activities of interest to you, or call your doctor or local mental health center to see if there is an older adults support group in your area that you could attend. If you are unable to drive, do not hesitate to ask for a ride, look into reduced special taxi fares for senior citizens, or take public transportation, if you are able.

- Do things you enjoy. If you have put things aside that you normally enjoy, get involved in those activities now. Go for that walk, plant flowers, or play cards with your friends.
- Write about significant experiences in your life and how they have affected you. Journaling gives you the opportunity to express your feelings in your own words and at your own pace. It is also an opportunity for you to share pieces of your life with future generations.

It is important to return to your usual routine at your own pace; however, if your symptoms do not seem to be subsiding or if they appear to be getting worse, you may want to speak with a mental health professional. If you have already been diagnosed with a mental health disorder or if you find you are distressed about traumatic events from your past, you may want to meet with a mental health professional as a precautionary measure. To find a mental health professional in your community, contact your primary care physician, a local mental health center, or your area mental health association.

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RISK COMMUNICATIONS

During a Terrorist Attack or Other Public Health Emergency

11

RISK COMMUNICATIONS DURING A TERRORIST ATTACK
or Other Public Health Emergency

The release of health-related information during a terrorist attack or other public health emergency is a critical part of the national response to the event, and government officials at the U.S. Department of Health and Human Services (HHS) and state and local health departments are aware that the quality, timeliness, and credibility of our messages and messengers may make the difference between people staying safe or becoming vulnerable to health risks presented by the emergency.

Federal officials have learned, sometimes the hard way, that institutional pressures and deeply rooted processes can get in the way of effective communication during an emergency. They are also learning that the public receives information and makes decisions about how it will respond differently during emergencies than during nonemergency times. This section reflects a combination of what public health officials have learned from experience as well as lessons learned from previous terrorist attacks, natural disasters, and other public health emergencies; communication research; and the insights of risk communication experts.

Terrorist attacks and public health emergencies present different situational characteristics and different emotional and psychological dynamics in the general public that affect how we deliver information. Some of the most significant emotions expressed include fear and anxiety (This is horrifying. Where can we turn? What awful things are ahead?! What do I do now?); anger (How could they?!); misery, depression, and empathy (poor victims); hurtfulness (Why do they hate us so?); and guilt (How come I survived and they didn't? How dare I still care about day-to-day trivia?). Some of these characteristics and their implications for how HHS and other public health officials plan to communicate are discussed below.

Lives are at stake. As with many public health issues or natural disasters, information has the power to save lives—possibly many, many lives. People require information to find out what is actually happening and also what they must do to safeguard their own and their family's personal safety. But strong emotional responses to the event—fear, misery, concern, guilt, anger—make understanding and acting upon that information more difficult.

There is great uncertainty. Almost every instance of terrorism would present a profoundly new and previously unknown set of circumstances—to government officials working to manage the situation and to the public at large. Many pathogens considered to be potential weapons are almost never seen in the United States. Even though a lot is known about these agents and how they might present themselves, in reality not everything is known, as one would like it to be, in the event of a terrorist attack. (Such was the case when anthrax was distributed through the mail. Before that time, medical experts were not sure whether people could contract anthrax through the mail.) Individuals and communities will be trying to cope with the situation and take necessary actions to protect their health and safety, while what is known and believed is unfolding with the constantly evolving story.

Individual and community levels of distress peak. Fear and uncertainty lead to unusually high levels of distress. Because of the psychological impact of acts of terrorism—and of many public health emergencies—it is not enough for HHS officials to give the facts of the situation and tell the public what to do, and expect that people will actually take these protective actions. High distress levels can keep individuals and communities from engaging in protective behaviors. However, how public health officials communicate can actually help channel this distress into productive and protective behaviors instead of destructive ones. Distress, if not excessive, leads to information-seeking and precautionary behavior. But great distress or fear can also make it hard for people to process information. HHS will be working hard to word messages simply and repeat them often. People can better bear their fear and make appropriate decisions about safeguarding their health and safety when their fears are acknowledged, as opposed to when they are told not to be fearful. HHS' goal will be to clear and be respectful of the distress people are feeling.

The psychology of response to a terrorist attack is different from that of response to other types of emergencies. Current knowledge and widely accepted theories of disaster psychology suggest that there are many aspects of a terrorist attack, biological or other, that have an impact on how the public thinks, feels, and responds to information. This will have implications for how HHS communicates with the public.

HIGH DISTRESS LEVELS

can help keep individuals and communities from engaging in protective behaviors.

Some of these psychological aspects include:

- The intentional nature of the assault (as opposed to hurricanes and floods, for example)
- Unfamiliar agents or pathogens (as opposed to typical strains of influenza, which cause many deaths each year but are not so greatly feared as anthrax, which has caused relatively few deaths)
- The random nature of the attacks and the fact that they are largely outside our (Americans', the officials', the media's, etc.) control
- The potential for permanent and catastrophic harm and loss
- The involuntary nature of exposure (as opposed to smoking, for example, which causes smokers to suffer health and social consequences because of their voluntary exposure to tobacco and smoke)

Given these aspects of terrorism, it is known that people react and respond to information differently in times of attack from the way they do in ordinary times.

In What Ways Do People React Differently to Terrorism?

Based on experience from past emergencies, many public health experts believe that an individual's decisionmaking process changes during a catastrophic emergency related to terrorism. The natural reactions people have in other emergencies may become even more exaggerated. Examples include:

- **People simplify.** Individuals' ability to comprehend numerous levels of detail decreases early in their response to an emergency. This means that people will generally miss nuances that help define the situation early. Public health guidance, including the protective actions individuals need to take, should be stated clearly, simply, and repeatedly.
- **People become much more vigilant in a crisis.** They check out their neighbors for signs of terrorism, surf the Internet for background information, and become glued to the media for news and context. This hypervigilance can have negative emotional consequences (added trauma from additional exposure to a traumatic event, for example), but is also useful as it helps people collect and assess the information they are getting. Is it consistent? What do people they respect think about it?
- **People maintain their current beliefs.** People are adept at maintaining faith in their current beliefs during a crisis. They tend to avoid contradictory or conflicting information. This means that if a new situation challenges conventionally held beliefs or views, it may be difficult to convince people that there is a new truth. Resistance to change in beliefs increases.
- **People rely on past experiences.** Whether or not past experiences are relevant, people use them to help define new ones. People remember what they see. They tend to believe what they have experienced in their own lives. However, faced with a terrorism emergency, they will have to rely on experts. But even reputable experts may disagree about the level of threat, the risks, and the appropriate recommendations. In nonemergency times, there is a natural give and take among experts that is expected and helps shape scientific debate. However, in times of crisis, this lack of agreement may leave the public with increased uncertainty and fear. According to some risk communication experts, the first message to reach listeners may often be the most accepted message, even if more accurate information surfaces later.

What Are the Objectives of the Public in a Public Health Emergency?

Most citizens share five main objectives during public health emergencies, including those caused by acts of terrorism:

- Protect themselves and loved ones
- Get the facts they want and need to protect themselves
- Be able to make choices and take action
- Be involved in the response
- Stabilize and normalize their lives

> **"THE ONLY THING OUR BOSSES TOLD US THAT WE MUST DO** in every story that we did is to remind the public that how this thing spreads and the risk of getting it is low ... with more knowledge people were more comfortable..."
>
> *Piya Chattopadhyay, correspondent, Canadian Broadcasting Radio, Toronto*
> *Reported on the SARS outbreak in Toronto 2003*

How People Feel Can Affect Their Ability To Meet Those Objectives.

There are many ways people's feelings can affect their responses. Some examples include:

- **Fear.** Fear is one of the single most powerful emotions present during a terrorism emergency. It has the capacity to propel community members to action. Whether that action is helpful or harmful to the community depends on whether the individual can hear, understand, and act on sound guidance from public health authorities. Public health officials have the capacity to help individuals channel their fear and distress into protective actions, rather than irrational behaviors. Interestingly, in the aftermath of past emergencies, it has been observed that people seldom panic. People act. Effective communication can help people take the most appropriate actions to support the public health response.
- **Denial.** No doubt, some members of the community will be in denial. They may choose not to hear or heed warnings or recommended actions. They may become confused by the recommendations or simply not believe that the threat is real or that it is an actual personal threat. In such cases, people will not act on even the best advice. Denial, in fact, is one of the reasons why panic is rarer than we realize. People go into denial as a coping mechanism when the fear is too great. But there are several important antidotes to denial. The two key ones are: first, the legitimization of fear—people who feel entitled to be afraid don't have to go into denial; and second, action—people with something to do have more capacity to tolerate their fear and, therefore, are less vulnerable to denial.
- **Hopelessness, helplessness.** Some people can accept that the threat is real, but it looms so large that they believe the situation is hopeless and so they feel helpless to protect themselves. The resulting withdrawal and paralysis can impair their ability to take appropriate protective action in a public health emergency. People who feel powerless to affect the outcome are more likely to retreat to denial and the resulting hopelessness and helplessness that lead to inaction. Therefore, self-efficacy is important. Hopelessness, helplessness, and denial are all reduced by messages of self-efficacy and empowerment (not "everything will be fine," but "it's a bad situation, but there are things you can do to make it better, such as…").
- **Stigmatization.** Some members of the community may suffer even greater effects from the attack if the rest of the community stigmatizes them. Fear or isolation of a group may occur if the community perceives it as contaminated or "risky." For example, in some cities, residents avoided "Chinatown" and Chinese restaurants out of fear of exposure to SARS. This type of stigmatization can hamper community recovery and affect evacuation, relocation, or, when necessary, quarantine efforts. In addition, groups people perceive as related to those who are "to blame," such as Arab-American communities following September 11, can become targets of local violence, even though they are as much victims of the terrorist attack as their neighbors.
- **Vicarious rehearsal.** Interestingly, experience has shown that people farther away (by distance or relationship) may react as strongly as those who are more directly impacted. Today's communication environment allows people to participate vicariously in a crisis in which they are not in immediate danger. This psychologically normal response to new risky situations results in people mentally rehearsing the crisis as if they were experiencing it and asking themselves, "What would I do?" In their minds, they imagine that the risk is here (instead of there), now (instead of soon), and definite (instead of maybe). They may believe that they, too, are at immediate risk and demand unnecessary services; as a result, they may go to the emergency room or take medications they do not need. Their stress reactions will be

> **"THE GOAL OF BIOTERRORISM IS TO CREATE TERROR;** to inflict psychological injury. Terrorist acts involving biological agents and other Weapons of Mass Destruction are particularly terrifying. Uncertainties about exposure, treatment options, and long-term effects will produce widespread fear, anxiety, and distress. It is critical that reporters who write about bioterrorism understand the psychological and mental impacts of bioterrorism."
>
> *Vincent Covello, Ph.D., director of the Center for Risk Communication*

high, even though they are not in immediate danger, often resulting in some of the health consequences of stress. Further, because many of the agents are invisible and difficult to detect, we may not always be able to tell a community with certainty that it has not been exposed. This imaginative leap from there/soon/maybe to here/now/definitely can be beneficial if it is acknowledged and the opportunity is taken to prepare, emotionally and logistically, for a real crisis.

What Does This Mean for How HHS Will Communicate With the Media and the Public?

In times of emergency, HHS will be working hard to deliver the information that people want and need:
What happened? Am I safe? Is my family safe? Who's in charge? What is being done to protect me, my family, and my community? What can I do to protect myself? Why did this happen? When will it be over?

However, some things that people need to know are not easy for them to hear: that people are dying, that the risks are not really understood, that it is not known when the emergency will be over, and that decisions may have to be made with imperfect information.

Most importantly, people need to know what to do to protect themselves and their families. Sometimes this is easy to hear and easy to act on. But there are times when public health guidelines are not consistent with personal beliefs or instincts. These are times when delivering guidance takes more than printing words on a page or reporting to the viewing and listening audiences what they need to do. It takes more because the public will need to be led toward protective actions.

For example, if a community is exposed to the smallpox virus, public health guidance will likely include recommending that people not leave the region. A common response might be: "Not leave the region? But why not? I want to take my children to my mother's house in the next state, where they will be safe." However, if a vaccination program starts, the vaccine will be available in the affected region and possibly not near Grandma's house. In addition, anyone potentially exposed to the virus would not want to carry it to another state, perhaps spreading the disease.

This example shows how public health guidance can conflict with personal inclinations. This conflict can make it difficult for the public to act on such guidance.

Based on the experiences with September 11 and the subsequent anthrax and ricin incidents, public health professionals are developing new ways to deliver information to the news media and the public. Following are the types of critically important information that public health officials hope to be able to deliver to reporters during public health emergencies.

HHS is committed to providing accurate and timely information to affected audiences, including state, local, and tribal governments; the media; the private sector; and the local populace. Communication with special needs audiences, including hearing and sight impaired populations or people with other disabilities; non-English speaking populations; and low-literacy audiences is a high priority in a public health emergency. In the case of terrorism or a severe public health emergency where several other federal agencies are involved, HHS will coordinate its response with other federal agencies as well as through the federal Joint Information Center.

TABLE 1: INFORMATION THAT PUBLIC HEALTH OFFICIALS MAY PROVIDE IN A PUBLIC HEALTH EMERGENCY

WHAT	WHY	EXAMPLE
Expression of empathy and acknowledgment of fear and uncertainty	Public health officials have historically been trained not to speak with or about emotions; rather, about fact. Therefore, expressing empathy, fear, or uncertainty can be particularly difficult for officials to do. Experts believe that citizens need to know that their feelings are understood and acknowledged by authorities. This helps establish a connection and makes it a little easier for audiences to hear the difficult information that usually follows.	"Whatever it [the loss of lives] is, it will be more than we can bear…" R. Giuliani, September 11, 2001
Clarification of facts	Public health officials will try to provide as much factual information as they can about the situation.	"At 2 p.m. today, a 34-year-old woman entered the Johnston Hospital Emergency Room with an unknown illness…"
What is not known	Just as expressions of empathy do not always come naturally, discussing the unknown elements of the situation also goes against years of professional training and experience. Many public health officials are used to having confirmation of all of the facts before releasing information. Just as important as what is known is what is not known. There will be many things public health officials do not know, especially when they suspect an illness but have not yet confirmed it. It is also likely that, in the initial stages of the investigation, they will not know the route of exposure or what/who caused the situation. The nature of terrorism is pushing public health officials to change the way they release information to the public. They realize that waiting until they have an answer to every possible question could jeopardize public safety. As their understanding of the situation evolves, they will provide you with updates on what is known and what is not known.	"We know that we have two confirmed cases of pneumonic plague, but we do not know right now how these patients were exposed to plague bacteria."
Steps taken to get more facts	Although there is much they may not know, public health officials can tell you the immediate steps taken to get more facts and to begin to manage the public health emergency. Immediate steps might include isolating patients, conducting an epidemiological investigation, alerting the public to signs and symptoms, activating the Health Alert Network, etc. The public can more easily accept high levels of uncertainty when they are aware of the actions taken to find answers.	"We do not know yet how many people have been exposed to the contaminated food, but we are talking to everyone who ate at the restaurant on May 6. If you ate at Joe's Restaurant on May 6, please call 1-800-xxx-xxxx."
Call to action—giving people things to do	In a crisis where immediate action needs to be taken (e.g., sheltering-in-place due to a radiological incident), this may be a key part of the message. In some cases, even symbolic actions can help channel people's energy and desire to do something.	Protective actions: Boil water before drinking or drink bottled water. Helpful actions: Donate time or money to a charity providing assistance, check on elderly neighbors. Symbolic actions: Attend a vigil or fly the flag.
Referrals	Public health officials will tell you when the next update will occur and where you and the public can go for more information, help, or support, such as hotlines or Web sites with more detailed information.	"We expect to have the test results confirmed within the next 12 hours and will let you know what we are dealing with at that time…"

“IN THIS ENVIRONMENT, EVENTS AND INFORMATION PLAY OUT IN REAL-TIME; LIVE; 24/7; NONSTOP.

As a result, we get news by increment. Each little development becomes the latest ‘breaking news’ piece set into the mosaic of the larger story. This can be helpful or it can be a terrible distraction. One of the challenges for news organizations is to make sure incremental news is proportional and provides context.

The advent of incremental news brings with it the danger of ‘information lag.’ That is the time between when the media asks a question and a responsible official can answer it. That time lag can be minutes or it can be hours. In some cases—such as with certain types of bioterrorism—it may even be days. This truly is the most precarious time in the story process, when uninformed speculation and rumor can fill the information void. This can be a very dangerous thing. We saw this play out during the anthrax attacks of 2001. It is why news organizations and public officials alike need to learn and appreciate what I call the ‘language of live.’ The ‘language of live’ recognizes the realities of the 24/7 world. It is a transparent language that is deliberate and clear. It explicitly states what is and what is not known, confirmed or corroborated. It directly attributes sources of information. It labels speculation as such. It quickly doubles back on bad information to correct the record. The ‘language of live’ is a language that many journalists employed fluently in the days after 9/11...

Similarly, news organizations were broadly praised after 9/11 for their measured and purposeful work. There was a responsible attitude, humanity but also professionalism. Questions were asked and answered in a measured way. The information and the tone were straightforward and sober. Most sought to keep speculation to a minimum.

There are some things the ‘language of live’ should not be—especially when we’re talking about the coverage of terrorism. It should not be breathless. It should not be hyped. It does not need to be accompanied by sensational graphics or ominous music. The facts will be ominous enough.”

Frank Sesno, university professor of public policy and communication at George Mason University and former Washington, D.C. bureau chief for CNN

Testimony before the House Select Committee on Homeland Security, September 2004

PUBLIC REACTIONS TO CRISIS SITUATIONS
and Communication Implications *by Peter M. Sandman, Ph.D.*

ESSAY

In the stairwells of the World Trade Center on September 11, 2001, survivors tell us, many people felt panicky, but their behavior was calm, orderly, helpful to others, sometimes even heroic. The panic attacks came later, when the crisis and the need for urgent action were over.

The impression that people are panicking and the prediction that they are likely to panic are not just mistakes. They are dangerous mistakes. The impulse to "avert" panic too often leads authorities—and sometimes even journalists—to sound over-reassuring, withholding or shrugging off information they consider too alarming for the public to tolerate. Paradoxically, this may actually increase the probability of panic, as people come to feel that those in charge are "handling" and misleading them instead of leveling with them.

The strongest antidote to denial is, paradoxically, the legitimization of fear.

Whereas panic is rare, another extreme reaction—denial—is fairly common. Denial, in fact, is partly why panic is rare; people at risk of panicking often trip a mental circuit-breaker and go into denial instead. The dangerous thing about denial is that people in denial do not take precautions in a crisis (or the run-up to a crisis), and this can lead to more harm to themselves and others. Apathetic people, of course, also fail to take precautions. In communication terms, the problem with denial is that it looks a lot like apathy. The difference is that apathy responds well to scary warnings—but that is the wrong prescription for denial, since it only forces people deeper into it. Nor will over reassurance work for denial; it colludes with the denial and thus strengthens it. The strongest antidote to denial is, paradoxically, the legitimization of fear. If it is okay to be afraid, then I do not have to deny my fear and can find ways to tolerate it instead.

The public can usually tolerate its own fear fairly well, especially if there are things people can do to protect themselves.

Crisis managers often find even modest levels of public fear intolerable—which may be why some interpret the public's fear as panic. The public, on the other hand, can usually tolerate its own fear fairly well, especially if there are things people can do to protect themselves; as psychiatrists and soldiers have long recognized, action binds anxiety.

We are hardwired to respond fearfully to new dangers; that response is more conducive to survival than fearlessness is. In fact, it is arguable that we tend to recover rather too easily from fear. We quickly get used to the New Normal; we relax our vigilance and our sense of shared urgency. Finally, note that when people become suddenly afraid of X, they typically become less afraid of Y and Z and less vulnerable to free-floating anxiety. For the most part, each individual is as anxiety-prone and fear-prone as he or she is wired to be. We allocate our fear. During a crisis, we are temporarily more afraid; we draw on a reservoir of untapped fearfulness. But very quickly we revert to our normal level of fearfulness—but with more of our normal fear attached to the new risk and less of it available for other risks.

Fear is not a problem in a crisis. It is part of the solution.

What level of fear is optimal for a public response so that people will protect themselves and those around them? Panic, denial, and apathy are all undesirable extremes. So is terror—that is the terrorists' goal. But if terror is too strong a response, mere interest or mild concern is often too weak. In a crisis, we want people to put their ordinary concerns aside, to be vigilant, to take precautions, to tolerate inconveniences. Fear is not a problem in a crisis. It is part of the solution.

But of course fear is not the only emotional response to crisis. Just as important is the empathy/misery/depression complex of emotions. One of the principal reactions to September 11 was and still is a sense of shared misery. Most people expect to survive whatever the terrorists throw at us. But we expect to have to watch a succession of terrorist attacks on CNN. Whether or not life got scarier after September 11, it certainly got more miserable. To a lesser but significant extent, all calamities provoke misery.

It is important to distinguish empathic overreactions—misery, even depression—from fear and its relatives. To tell a

miserable person to calm down misses the point; he or she is calm already. For those who communicate with a public in misery, here are a few effective ways to do so:

- Acknowledge and help us acknowledge that misery is part of what we are feeling
- Affirm that in a situation like this misery is an appropriate feeling
- Let us know that you feel it too
- Expect us (and yourself) to bear it, and in time to get past it
- Suggest empathic actions, ways we can help others

Hopefully, these guidelines will be followed by public officials and can be of use to media as well, as the media also play a critical leadership role in times of crisis.

Anger, hurt, and guilt are also common and appropriate reactions to a crisis.

Anger is also an appropriate reaction to crisis, and especially to terrorism. It is useful: it fuels resolve, vigilance, precaution-taking. Of course it can also fuel scapegoating and harassment—not all angry behaviors are useful, but some degree of anger itself is. When anger escalates into rage or flips into denial, it is no longer functional.

Hurt feelings often go unnoticed or unacknowledged as a response to crisis, but many crises do threaten our self-esteem: "Why did this happen to me?" Once again, terrorism crises are an extremely vivid example. After September 11, virtually everyone was asking the bewildered question, "Why do they hate us so?" This is an important question to ask and to try to answer. But not everyone was looking for answers; many just wanted to express their hurt feelings. Hurt, too, can flip into denial; it is hard to hold onto the idea that people actually hate you so much that they want to kill you.

Guilt also plays an important role—caretaker guilt (I feel powerless to protect my family, my community, my constituents); survivor guilt (which results largely from projected relief—I'm okay and they're not); and above all guilt at continuing to be preoccupied with our own mundane concerns. A Minnesota County Commissioner who is also a florist told me about all his

FIGURE 11–1: RESPONSE TO CRISES

wedding customers in the days and weeks after September 11. Shipments of flowers (among other things) were disrupted, and his customers were worried about the flowers for their weddings. But they also felt guilty about worrying about such things. So he learned that he not only needed to reassure them that they would have their flowers, he needed to reassure them that we all need beauty right now … that their floral worries were not wrong or selfish.

Fear, misery, anger, hurt, guilt—all normal responses to crisis (for public officials and media as well as the public). But we bear them and we get beyond them—perhaps not immediately, perhaps not easily, but we do it. Resilience is also a normal response to crisis.

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A JOURNALIST'S REFLECTIONS
on Fear and Risk *by David Ropeik*

ESSAY

It is generally not the news media's responsibility to consider the effect their coverage will have on the public. But in extraordinary cases, such as a terrorist attack, in which fear is part of what the attackers are trying to inflict, news editors and TV news directors, print and broadcast writers and producers, and reporters and photographers need to consider that their coverage may in fact serve as part of the attackers arsenal. And while coverage of terrorism may not spawn direct copycats the way coverage of suicide or bomb scares might, it certainly will spawn public fear, and that fear can threaten public health far more profoundly than the suicide and bomb scare stories about which the press is already rightfully careful.

There is a body of research that can help news organizations understand and consider the effect their coverage of a terrorist attack might have on public attitudes, and therefore, on public health. Psychological studies of risk perception show that such an event will hit several intuitive "fear factors" that we all use, subconsciously, to decide what to be afraid of and how afraid to be.

Research has shown that our perceptions of risk are more intuitive and emotional than fact-based, and that risks that feature certain characteristics evoke a degree of fear that rarely matches the actual degree of hazard. People are more afraid of risks that are:

- New (as opposed to risks we've lived with for a while)
- Uncertain (compared with risks we fully understand)
- Imposed (compared to risks we choose to take)
- Catastrophic ("event" risks, like plane crashes, as opposed to risks that occur to individuals over time, like heart disease)
- Available to our consciousness (the greater the awareness, the greater the concern; studies show that the news media play a critical role here)
- Personified (a risk that has a real victim with a name and a face in comparison to a theoretical risk)
- A personal threat (a risk you think can happen to you, like anthrax in the U.S. mail, compared to a risk that is real but you think will only happen to someone else)

A terrorist attack involves many of these perceived risks, and therefore, is the perfect formula for elevated fear. This fear can lead to dangerous choices, denial, or extreme stress and resulting damage to health and safety.

Clearly, the public will look to the news media for information in the event of a terrorist attack. Appropriately, coverage will be extensive, and certainly dramatic. The "Who, What, Where, When, and Why" of the story will be inescapably alarming. But, as with other disaster and emergency stories that can directly affect public health, the quantity, quality, and tone of the coverage of a terrorist attack will have a dramatic impact on public behavior and health. It is my hope, as both a journalist and a risk communicator, that responsible news organizations will want to consider these issues as part of pre-event reflection on covering such an attack should one occur:

- Keep the risk in perspective. Consider how many people are actually exposed (radiation from a dirty bomb is a localized risk) and the severity of the consequences (some weapons are less harmful than others).
- Remember that, as mentioned above, the more frightening your coverage, the more fear it will breed and the more the coverage might help terrorists achieve their goals.
- While giving the public all the information available, try to incorporate relevant public health instructions. When appropriate, provide information that will help readers, viewers, or listeners take actions to protect themselves, their loved ones, and others for whom they may be responsible.
- Accept that in the unique circumstances of any such attack, officials can't possibly have all the answers to many critical questions, especially early on. (Beware those that do!) That's not incompetence, just reality.

› Beware of the instant experts. They're a dime a dozen at times like this and the knowledge many of them profess is often quite shallow. "Information" from self-described experts stepping beyond the bounds of their knowledge can potentially confuse the public.

Don't ignore the stress, loss, and other danger you and your peers face. As some of the reporting from embedded journalists under fire in Iraq demonstrated, the feelings you face covering the story can challenge your objectivity.

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HISTORY
of Biological, Chemical, and Radiation Emergencies

12

HISTORY
of Biological, Chemical, and Radiation Emergencies

GOAL OF THIS SECTION

To put the current and potential use of biological, chemical, and radiological weapons into historical context.

WHAT THIS SECTION INCLUDES

- **A brief summary of the history of biological, chemical, and radiation emergencies**
- **Examples of chemical and radiological accidents and their effects**

WHAT THIS SECTION DOES NOT INCLUDE AND WHY

Extensive detail on any one event is not provided due to the large number of events, weapons, and issues described here.

The first public health emergencies were epidemics. With technological advances came the potential to harness biological, chemical, and radiological agents for military and terrorist ends. This section highlights the evolution of the relevant biological, chemical, and radiological technologies and their use as agents of war or terrorism. This section also gives examples of chemical and radiological accidents.

BIOLOGICAL WEAPONS

TIMELINE

14th–15th centuries: Armies use rotting and contaminated bodies to transmit infection to the enemy.

18th century: British troops use smallpox as a weapon against American Indians.

1914–1918 (World War I): Germans infect livestock with glanders and anthrax to disrupt the food supply of Allies.

1925: Geneva Protocol prohibits the use of biological and chemical weapons.

1928: USSR launches its bioweapons program.

1932–1945: Japan conducts bioweapons research and tests on human subjects.

1939–1945 (World War II):

- Japan attacks 11 Chinese cities with anthrax, cholera, and the plague.
- Allies experiment with anthrax.

1950s: The United States and the Soviet Union research new ways of dispersing bioagents.

1969–1970: President Nixon orders the dismantling of the U.S. bioweapons program.

1972: Biological Weapons Convention bans biological weapons.

1970s and 1980s: The Soviet Union continues to research and produce bioweapons.

1980s and 1990s: Iraq, Iran, North Korea, and other nations develop bioweapons.

1984: The Rajneeshee Cult contaminates salad bars in Oregon with *Salmonella*.

2001: An unknown terrorist(s) attacks with anthrax via the U.S. Postal Service.

THE PREMODERN ERA

In the 14th and 15th centuries, armies used rotting and infected human and animal bodies to transmit infections to both civilian and army populations. This tactic met with mixed success.

Medieval lore has it that, in the 14th century, Kaffa (which is now Feodossia, Ukraine) was under siege by Tartars. During that siege, bubonic plague broke out among the invaders. The invaders then used catapults to hurl plague-infected bodies into the city. The spread of the disease caused the city's fall, but it is impossible to know whether the outbreak actually resulted from this primitive practice of biowarfare.

During the 18th century, the British used smallpox as a bioweapon. In 1763, British troops took blankets and handkerchiefs from smallpox patients and gave them to Delaware Indians at a peace-making parley. Also, after an outbreak of smallpox at Fort Pitt during the French and Indian War, British officers took blankets from a smallpox hospital and gave them to American Indians.

BIOWEAPONS IN THE ERA OF MICROBIOLOGY

The nature of biowarfare changed in the mid-19th century. Before that time, the use of biowarfare depended on an existing epidemic. Along with germ theory and the ability to use vaccines to control and prevent epidemics, scientists also learned to isolate disease-causing germs in a form that was easy to use and produce. With these advances, more sophisticated tools for biowarfare became available.

Early efforts to use bioweapons during World War I met with little success. German agents infected livestock with glanders and anthrax (glanders is an infectious disease that typically affects horses, donkeys, and mules). These animals were then shipped through neutral countries to the Allies. The goal was to disrupt the food supply and transportation in countries that used animals for transport. A few thousand animals died as a result of this program. Its impact was small compared to the millions killed during World War I.

After World War I, in an effort to limit the use of biological and chemical weapons, the 1925 Geneva Protocol (http://www.state.gov/www/global/arms/treaties/geneva1.html) prohibited the use of chemical and biological agents but did not bar research and development on those agents. The treaty, however, was not fully enforced for many years. The United States signed the protocol, but Congress failed to ratify it for 50 years. Japan also failed to ratify the treaty until 1970.

Prior to and during World War II, the Japanese were adept at developing and using bioweapons. Between 1932 and 1945, a staff of more than 3,000 scientists conducted bioweapons research in Manchuria, near the town of Pingfan. Japanese scientists used human subjects to test a number of bioagents, killing hundreds, if not thousands, in the process.

During World War II, Japan conducted 12 large-scale field trials of biological weapons. Japan attacked at least 11 Chinese cities with anthrax, cholera, and the plague. The Japanese contaminated food and water supplies. They also released contaminants and plague-infected fleas from aircrafts. Each attack of plague-infected fleas may have involved the release of as many as 15 million fleas.

The Japanese troops were themselves unprepared for their own use of bioweapons. One bioattack on Changleh in 1941 resulted in illnesses in 10,000 Japanese soldiers and 1,700 deaths, mostly from cholera.

These Japanese field trials came to a halt in 1942, after Franklin D. Roosevelt publicly denounced them. However, basic research continued until the end of the war.

The Soviet Union launched its bioweapons program in 1928 and expanded it significantly during World War II. The Soviets built their first anthrax factory in 1946 and their first smallpox factory in 1947. During World War II, they captured a number of Japanese experts who had worked on their country's bioweapons program. These experts helped Soviet researchers advance the Soviet bioweapons program.

France, Canada, Great Britain, and the United States also had significant bioweapons programs during World War II. These countries wanted to be prepared to retaliate against any German bioattack. Allied experiments with anthrax contaminated Guinard Island, near the Scottish Coast. The island was decontaminated with formaldehyde and seawater in 1986.

The United States had stockpiled thousands of anthrax bombs during World War II, but many considered these weapons to be impractical. The production facility in Terre Haute, Indiana, lacked necessary engineering safety features. Tests of the plant's fermentation and storage processes revealed contamination of the plant and nearby area. This discovery led to limitations on the production of bioweapons.

The bioweapons research programs in the United States and the Soviet Union flourished during the Cold War. Researchers studied many bioagents. They also developed more sophisticated delivery systems—for example, dispersing agents as fine-mist aerosols, packing them in bombs, and launching them in missiles. From 1950 to 1953, the United States, having learned a lesson from the Terre Haute plant, built a new facility with better biosafety measures in Pine Bluff, Arkansas. At Fort Detrick, Maryland, scientists studied the effectiveness of different bioagents and various delivery systems. They also studied vaccines and other defensive measures.

DISMANTLING BIOWEAPONS PROGRAMS

By the late 1960s, the tide had turned against bioweapons. In 1969 and 1970, President Nixon ordered the dismantling of the U.S. bioweapons program. But efforts to improve defensive measures continued. The U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) continued to develop medical defenses against bioattacks. USAMRIID has since focused on defensive measures, such as detection capabilities, personal protective equipment, vaccines, diagnostics, and therapies.

In 1972, the Biological Weapons Convention (http://www.state.gov/t/ac/trt/4718.htm#treaty) called for the destruction of existing stocks of bioweapons and an end to bioweapons research. Seventy-two countries ultimately signed the convention (http://www.state.gov/t/ac/trt/4718.htm#signatory), and it went into effect in 1975.

However, not all bioweapons development stopped with the ratification of the Biological Weapons Convention. The Soviet Union continued to operate at least six research facilities and five production facilities in the 1970s and 1980s. The Soviet Union employed up to 55,000 scientists and technicians in these facilities and actually expanded its program during this period. The sudden outbreak of anthrax in Sverdlovsk in 1979 revealed the existence of a nearby Soviet bioweapons research facility.

It was only in 1991, when the Soviet Union broke up, that the rest of the world learned how massive the Soviet bioweapons program was. The Soviets had been manipulating genes to make anthrax and smallpox bioweapons more lethal. Now disbanded, the Soviet program has left the bioweapons poorly guarded and stored. The location of remaining stockpiles of weapons is uncertain.

BIOWEAPONS TODAY

It is unclear at this time which countries have active bioweapons programs. In addition, the threat of bioattacks from non-state-sponsored terrorists remains. In 1984, the Rajneeshee Cult tried to influence voter turnout by contaminating salad bars in Oregon with *Salmonella*. A total of 750 people became ill, though none fatally.

CHEMICAL WEAPONS AND EMERGENCIES

TIMELINE

600–200 B.C.: Athenian, Spartan, and Carthaginian forces use poisons and smoke to quell enemies.

1618–1648: Smoke projectiles come into use in the Thirty Years War.

1914–1918 (World War I):

- **1915:** Germany uses chlorine against French troops.
- **1917:** Both sides use mustard gas for the first time.

1925: Geneva Protocol prohibits the use of biological and chemical weapons.

1935–1936: Italy uses chemical weapons in Ethiopia.

1939–1945 (World War II):

- Japan uses chemical weapons in China.
- The German army uses chlorine, mustard gas, and phosgene gas.

1980s: Iraqi army uses chemical weapons against Iraqi Kurds.

1981–1988: Mustard gas and nerve gas are used extensively during the Iran-Iraq war, mainly by Iraq.

1992: Chemical Weapons Convention bans chemical weapons.

1995: The Aum Shinrikyo Cult stages a sarin attack on the Tokyo subway system.

2003–2004:

- Ricin appears in the Dirksen Senate Office Building on Capitol Hill.
- London police discover a ricin plot.
- Ricin appears in a mailed parcel in South Carolina.

As with bioweapons, military use of chemicals has a long history. But unlike bioweapons, chemical weapons have a limited range and their impact resembles that of conventional weapons.

THE PREMODERN ERA

Dating back to ancient times, armies reportedly used a number of chemical agents in wartime. In 600 B.C., Solon of Athens was said to have put roots of hellebore (a poisonous plant) in the drinking water of Kirrha. During the Peloponnesian War, in 429 and 424 B.C., the Spartan forces used noxious smoke and flames against Athenian cities. And around 200 B.C., the Cathaginians attempted to sedate the enemy by leaving mandrake root in wine.

There were also isolated instances of reported use of chemical agents during the 17th–19th centuries—for example, smoke projectiles during the Thirty Years War.

THE MODERN ERA OF CHEMICAL WEAPONS

Developments in the chemical industry in the 18th and 19th centuries made possible the extensive use of chemical weapons that began in World War I. Chlorine, which is an asphyxiant, was first used in 1915. During the battle of Ypres in Belgium in 1915, Germany exploded canisters filled with chlorine gas, killing 5,000 French troops and injuring 15,000. The French troops were unprepared for these chemical weapons attacks. After that, troops began using respirators. However, other chemical agents were in use at that time, including chloropicrin, which could penetrate the respirators. The use of mustard gas on both sides began in 1917. It resulted in 91,000 deaths and 1.2 million injuries during World War I. By the end of that war, mustard gas had caused 80 percent of the casualties resulting from chemical attacks. The use of chemical weapons during World War I caused 3 percent of the total war casualties.

The 1925 Geneva Protocol covered chemical as well as biological weapons. But despite the Geneva Protocol, the use of chemical weapons continued. Italy used them in 1935 and 1936 in Ethiopia. Japan used them in China during World War II. New and more effective chemical agents were developed: The Germans developed tabun, the first nerve gas, in 1936. Sarin, soman, and VX followed. When World War II began, phosgene and mustard gas were considered superior to alternative chemical weapons, such as chlorine and tear gas. During the war, Germany began manufacturing tabun. Sarin later emerged as the preferred nerve gas for military purposes because it could be produced in large quantities.

Experts believe that more than 20 countries in the Middle East, Asia, Europe, and North American now have chemical weapons capabilities. During the 1981–1988 Iran-Iraq War, mustard gas and nerve agents were used extensively, mainly by Iraq. Iraq's chemical weapons killed more than 25,000 Iranians during this conflict. Most experts believe that the Iraqi army also used chemical weapons against the Iraqi Kurds in 1988. The discovery of mustard gas and sarin in Kurdish territory soil samples confirms these claims. The Aum Shrikyo Cult also used sarin in its attack on the Tokyo subway system in March 1995. That attack left 12 dead and 5,500 injured.

Large amounts of ricin have been discovered in caves in Afghanistan. And it was ricin, injected by means of a specially rigged umbrella, that caused the death in 1978 of Bulgarian writer and journalist Georgi Markov.

After lengthy negotiations, the Chemical Weapons Convention (http://www.state.gov/www/global/arms/treaties/cwctext.html) passed in 1992. This chemical-disarmament agreement makes it illegal to acquire, develop, produce, or stockpile chemical weapons.

Nevertheless, the threat of chemical warfare persists. At the time of the development of this guide, the most recent incident was the 2004 discovery of ricin on Capitol Hill.

CHEMICAL ACCIDENTS

In 1979, Union Carbide began to manufacture methyl isocyanate in its plant in Bhopal, India. Methyl isocyanate is a poisonous gas used to make pesticides. Since it is heavier than air, it does not rise when it escapes into the atmosphere.

On December 23, 1984, water seeped into one of the methyl isocyanate storage tanks at the Bhopal factory. The water then reacted with the methyl isocyanate, resulting in the release of 40 tons of methyl isocyanate into the atmosphere. The methyl isocyanate spread over a city of nearly 900,000 people, and thousands died as they slept. Hundreds of thousands were injured or maimed.

Numerous safety problems were present in the plant:

- Gauges were faulty
- The facility lacked temperature control
- Devices for neutralizing escaping methyl isocyanate were turned off for maintenance
- Warning systems were inadequate
- The tank was above its recommended capacity

Because of the Bhopal incident and later chemical accidents in U.S. factories, the U.S. Congress enacted a law that directed the Environmental Protection Agency (EPA) to develop a program to prevent and prepare for chemical accidents. In response to this directive, EPA created the Risk Management Program in June 1999. The goal of this program is to prevent releases of chemicals that could cause immediate, serious harm to human health and the environment and to communicate accident and prevention information to the public. Chemical facilities regulated under this program must develop and implement a risk management program and submit a summary of this program, called a "Risk Management Plan," to EPA a minimum of every 5 years. Due to concern that one part of the Risk Management Plans, the Offsite Consequences Analysis section, could be misused by terrorists, Congress passed the Chemical Safety Information, Site Security, and Fuels Regulatory Relief Bill in August 1999. This law created certain restrictions on public access to the Offsite Consequences Analysis section of the reports.

NUCLEAR WEAPON DEVELOPMENT AND TESTING

TIMELINE

1940: Scientists based in Britain first report that the production of a nuclear bomb is possible.

1941: British nuclear weapons research begins.

1943: Americans join the research effort with the "Manhattan Project."

1945: The United States drops atomic bombs on Hiroshima and Nagasaki, Japan.

1949: The Soviet Union conducts its first nuclear explosion test.

1968: Treaty on the Non-Proliferation of Nuclear Weapons is developed.

Nuclear weapon development and testing has been conducted by many countries since the 1940s. Because leaders of the allied nations during World War II were concerned that Germany was producing nuclear weapons, the Manhattan Project was born. The project brought together many of the world's leading scientists. The project was unable to produce a fission-based weapon before the surrender of Germany in 1945 but was able to produce two weapons later that year that were used in the U.S. atomic bombings in Japan (see next section).

In 1949, the Soviet Union conducted its first nuclear explosion test, which marked the beginning of the Cold War. The United Kingdom, France, and the People's Republic of China also demonstrated nuclear capabilities during the Cold War. It is thought that since 1949 there have been around 2,000 nuclear test explosions throughout the world.

In 1950, President Truman announced a program to develop a hydrogen or fusion bomb in response to the Soviet Union's nuclear testing. The first bomb tested by the United States on a remote island in 1952 was 450 times the power of the bomb that fell on Nagasaki. Other countries, including the Soviet Union, France, the United Kingdom, and the People's Republic of China, also developed similar devices in the years to follow.

Since the late 1950s, a number of treaties have been developed and signed by various countries in an attempt to control nuclear testing and proliferation. In 1968, the Treaty on the Non-Proliferation of Nuclear Weapons was developed to prevent the spread of nuclear weapons and weapons technology, to promote cooperation in the peaceful uses of nuclear energy, and to further the goal of achieving nuclear disarmament (United Nations Department for Disarmament Affairs 2002). In 1995, this treaty was extended indefinitely, and to date, 187 parties have joined the treaty, including the five countries mentioned previously that were active in nuclear development and testing. However, the nuclear threat is not over. Experts know that some countries, such as India and Pakistan, have active weapons programs, and it is suspected that a number of other countries also have active weapons programs or are pursuing the development of nuclear weapons.

RADIATION EMERGENCIES

THE ATOMIC BOMB

The first radiological public health emergency followed the use of the atomic bomb during World War II. The United States dropped the first bomb on Hiroshima, Japan, on August 6, 1945, resulting in about 60,000–70,000 deaths. When that failed to persuade Japan to surrender, the United States dropped a second bomb, on Nagasaki, on August 9. That bomb resulted in about 40,000 deaths. Five hours after the second bomb dropped, the Japanese surrendered unconditionally. Most of the damage from these bombs resulted from the flash, shockwave, and subsequent fire.

THREE MILE ISLAND

The threat of accidental radiological contamination became real to Americans with the Three Mile Island accident on March 28, 1979, near Middletown, Pennsylvania. Equipment malfunction and human error combined to cause one of the reactor cores to melt down and release radioactive gases into the atmosphere. In the following few days, additional radioactive releases took place. There was a precautionary evacuation advisory for pregnant women and young children within a 5-mile radius of the plant. Most of the radiation was contained; therefore, offsite releases were minimal and no apparent injuries resulted. The major health effect for portions of the nearby population was mental stress.

The plant experienced significant damage. The cleanup process raised health concerns because of the radioactive material trapped in the containment and auxiliary buildings. This accident was a close call. The scope of what could have happened served as a wakeup call for regulators who subsequently tightened and heightened the plant's safety oversight.

Several factors contributed to the accident: inadequate training of Three Mile Island operators, unclear operator instructions, and design flaws in the control room instructions and layout. The following are some measures that regulators and the nuclear industry took to improve U.S. nuclear plant safety after the accident:

- Upgraded plant and equipment design
- More rigorous plant operator training
- Better emergency preparedness
- Regular scrutiny of plant performance
- More frequent plant inspections
- Establishment of the industry's self-regulatory group, the Nuclear Energy Institute, which serves as a unified voice for the nuclear energy industry and advises the Nuclear Regulatory Commission on relevant regulatory issues
- Improved coordination among various federal and state agencies that are responsible for responding to such an emergency

CHERNOBYL

The most severe radiological accident to date occurred at the Chernobyl Nuclear Power Plant in the former Soviet Union on April 25–26, 1986. A reactor exploded, releasing massive amounts of radiation into the environment. The local population of about 135,000 within an 18-mile radius of the plant was evacuated. The accident caused 31 deaths, but the extent of delayed health effects is uncertain. The Chernobyl reactor would not have met Western safety standards. Fourteen such reactors are still operational in the former Soviet Union.

The chances of a Chernobyl-type accident occurring in the United States are small, because U.S. plants do not have the same design features and they all have concrete and steel containment structures to keep radiation inside. But the Nuclear Regulatory Commission staff looked at this incident for ideas about how to improve plant operations, staff training, and emergency preparedness in the United States, and many new reactor safety measures have been developed and implemented as a result.

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"I HAD A BETTER BASE THAN SOME OTHERS MIGHT HAVE, but then of course you don't really know the intricacies of how hospitals work. I didn't have a number to call CDC. I didn't know the media contact. Those things would have been helpful to have in getting organized."

Piya Chattopadhyay, correspondent, Canadian Broadcasting Radio, Toronto
Reported on the SARS outbreak in Toronto 2003

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Web site: http://www.health.state.ok.us

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WEST VIRGINIA

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STATE AND LOCAL CONTACTS

These fill-in-the-blank forms are designed for media professionals who would like to add contact information to this guide for their state and local public health departments and other contacts.

LOCAL CONTACTS

ORGANIZATION	NAME/TITLE	BUSINESS PHONE	CELL PHONE	E-MAIL	ADDRESS	HOME PHONE/ FAX/E-MAIL
Public Health Department						
Emergency Medical Services						
Local Red Cross						
Local FBI						
Fire Department						
Police Department						

OTHER LOCAL CONTACTS (e.g., HOSPITALS)

STATE CONTACTS

ORGANIZATION	NAME/TITLE	BUSINESS PHONE	CELL PHONE	E-MAIL	ADDRESS	HOME PHONE/ FAX/E-MAIL
Public Health Department						

OTHER STATE CONTACTS (e.g., STATE EMERGENCY MANAGEMENT)

ADDITIONAL CONTACTS (e.g., PERSONAL CONTACTS)

ORGANIZATION	NAME/TITLE	BUSINESS PHONE	CELL PHONE	E-MAIL	ADDRESS	HOME PHONE/ FAX/E-MAIL

A–J

APPENDICES

APPENDIX A. Acronyms

The following acronyms may be helpful. Most of these terms appear in this guide.

AHRQ	Agency for Healthcare Research and Quality (part of HHS)
AoA	Administration on Aging (part of HHS)
APHL	Association of Public Health Laboratories
API	American Press Institute
ARC	American Red Cross
ASTHO	Association of State and Territorial Health Officials
ATSDR	Agency for Toxic Substances and Disease Registry (part of CDC)
BSE	Bovine Spongiform Encephalopathy (Mad Cow Disease)
BSL	Biosafety Level
CBP	Customs and Border Protection (part of DHS)
CCRF	Commissioned Corps Readiness Force (part of PHS)
CDC	Centers for Disease Control and Prevention (part of HHS)
CFSAN	Center for Food Safety and Applied Nutrition (part of FDA)
CG	Phosgene
CIA	Central Intelligence Agency
Cipro	Ciprofloxacin Hydrochloride
CMS	Center for Medicare & Medicaid Services (part of HHS)
CPJ	Committee to Protect Journalists
DFO	Disaster Field Office
DHS	U.S. Department of Homeland Security
DMAT	Disaster Medical Assistance Team (part of NDMS)
DMORT	Disaster Mortuary Operational Response Team (part of NDMS)
DNA	Deoxyribonucleic Acid
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOL	U.S. Department of Labor
DQ	Division of Global Migration and Quarantine (part of CDC)
EAP	Employee Assistance Program
EEE	Eastern Equine Encephalitis
EIS	Epidemic Intelligence Services (part of CDC)
EMS	Emergency Medical Services
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
Epi-X	Epidemic Information Exchange (part of CDC)
ESF	Emergency Support Function
FDA	Food and Drug Administration (part of HHS)
FEMA	Federal Emergency Management Agency (part of DHS)
FOIA	Freedom of Information Act
FoodNet	Foodborne Diseases Active Surveillance Network (part of CDC)
FSIS	Food Safety and Inspection Service (part of USDA)
GA	Tabun
GD	Soman
HAN	Health Alert Network (part of CDC)
HHS	U.S. Department of Health and Human Services
HRSA	Health Resources and Services Administration (part of HHS)
ICS	Incident Command System
IFJ	International Federation of Journalists
IHS	Indian Health Service (part of HHS)
IND	Improvised Nuclear Devise
IV	Intravenous
JIC	Joint Information Center
KI	Potassium Iodide
L	Lewisite
LRN	Laboratory Response Network (part of CDC)
MRC	Medical Reserve Corps (part of HHS)
NACCHO	National Association of County and City Health Officials
NDMS	National Disaster Medical System (part of DHS)
NECC	National Emergency Coordination Center (part of FEMA)
NEDSS	National Electronic Disease Surveillance System (part of CDC)
NIAID	National Institute of Allergy and Infectious Diseases (part of NIH)
NIH	National Institutes of Health (part of HHS)
NIMH	National Institute of Mental Health (part of NIH)
NIMS	National Incident Management System

NIOSH	National Institute for Occupational Safety and Health (part of CDC)
NMRT	National Medical Response Team (part of NDMS)
NNRT	National Nursing Response Team (part of NDMS)
NPHIC	National Public Health Information Coalition
NPHPP	National Bioterrorism Hospital Preparedness Program (part of HRSA)
NPRT	National Pharmacy Response Team (part of NDMS)
NRC	U.S. Nuclear Regulatory Commission
NRP	National Response Plan (part of DHS)
NRT	National Response Team
NVPO	National Vaccine Program Office (part of HHS)
OPHEP	Office of Public Health Emergency Preparedness (part of HHS)
OSHA	Occupational Safety and Health Administration (part of DOL)
PHS	Public Health Service (part of HHS)
PHSA	Public Health Service Act
PIO	Public Information Officer
PTSD	Posttraumatic Stress Disorder
RDD	Radiation Dispersal Device
RED	Radiation-Emitting Device
RNA	Ribonucleic Acid
RRR	Rapid Response Registry (part of ATSDR)
SAMHSA	Substance Abuse and Mental Health Services Administration (part of HHS)
SAP	Select Agent Program (part of CDC)
SARS	Severe Acute Respiratory Syndrome
SEB	Staphyloccal Enterotoxin B
SERT	Secretary's Emergency Response Team (part of HHS)
SNS	Strategic National Stockpile (part of CDC)
TMP–SMX	Trimethoprim/Sulfamethoxazole
USAMRIID	U.S. Army Medical Research Institute for Infectious Diseases (part of DOD)
USDA	U.S. Department of Agriculture
VA	U.S. Department of Veterans Affairs
vCJD	Creutzfeldt-Jackob Disease
VEE	Venezuelan Equine Encephalitis
VHF	Viral Hemorrhagic Fever
VMAT	Veterinary Medical Assistance Team (part of NDMS)
WHO	World Health Organization
WMD	Weapons of Mass Destruction
WNV	West Nile Virus

APPENDIX B. Web Sites

The Web sites in the following list may be helpful sources of additional information. They are organized into three categories: federal government organization Web sites, federal government topical Web sites, and other Web sites. Please note that many of these Web sites, as well as additional Web sites referencing specific documents, also appear throughout the text.

FEDERAL GOVERNMENT ORGANIZATION WEB SITES

A

Administration for Children and Families (ACF)
http://www.acf.hhs.gov/

Administration on Aging (AoA)
http://www.aoa.gov/

Agency for Healthcare Research and Quality (AHRQ)
http://www.ahrq.gov/

Agency for Toxic Substances and Disease Registry (ATSDR)
http://www.atsdr.cdc.gov/

C

Center for Biologics Evaluation and Research (CBER)
http://www.fda.gov/cber/

Center for Devices and Radiological Health (CDRH)
http://www.fda.gov/cdrh/

Center for Drug Evaluation and Research (CDER)
http://www.fda.gov/cder/

Center for Food Safety and Applied Nutrition (CFSAN)
http://vm.cfsan.fda.gov/list.html

Center for Medicare & Medicaid Services (CMS)
http://www.cms.hhs.gov

Centers for Disease Control and Prevention (CDC)
http://www.cdc.gov/

Central Intelligence Agency (CIA)
http://www.cia.gov/

Commissioned Corps Readiness Force (CCRF)
http://www.usphs.gov/

Customs and Border Protection (CBP)
http://www.customs.ustreas.gov/

D

Defense Logistics Agency (DLA)
http://www.dla.mil/

Department of Agriculture (USDA)
http://www.usda.gov/

Department of Commerce (DOC)
http://www.commerce.gov/

Department of Defense (DoD)
http://www.defenselink.mil/

Department of Energy (DOE)
http://www.energy.gov/

Department of Health and Human Services (HHS)
http://www.hhs.gov/

Department of Homeland Security (DHS)
http://www.dhs.gov/

Department of Justice (DOJ)
http://www.usdoj.gov/

Department of Labor (DOL)
http://www.dol.gov/

Department of State (DOS)
http://www.state.gov/

Department of the Interior (DOI)
http://www.doi.gov/

Department of Transportation (DOT)
http://www.dot.gov/

Department of Veterans Affairs (VA)
http://www.va.gov/

Division of Global Migration and Quarantine (DQ)
http://www.cdc.gov/ncidod/dq/

E

Environmental Protection Agency (EPA)
http://www.epa.gov/

F

Federal Bureau of Investigation (FBI)
http://www.fbi.gov/

Federal Communications Commission (FCC)
http://www.fcc.gov/

Federal Emergency Management Agency (FEMA)
http://www.fema.gov/

Food and Drug Administration (FDA)
http://www.fda.gov/

Food Safety and Inspection Service (FSIS)
http://www.fsis.usda.gov/

H

Health Resources and Services Administration (HRSA)
http://www.hrsa.gov/

I

Indian Health Service (IHS)
http://www.ihs.gov/

M

Medical Reserve Corps (MRC)
http://www.medicalreservecorps.gov/

N

National Advisory Committee on Children and Terrorism (NACCT)
http://www.bt.cdc.gov/children/index.asp

National Center for Environmental Health (NCEH)
http://www.cdc.gov/nceh/

National Center for Health Statistics (NCHS)
http://www.cdc.gov/nchs/

National Center for Toxicological Research (NCTR)
http://www.fda.gov/nctr/

National Communications System (NCS)
http://www.ncs.gov/

National Institute for Occupational Safety and Health (NIOSH)
http://www.cdc.gov/niosh/homepage.html

National Institute of Allergy and Infectious Diseases (NIAID)
http://www.niaid.nih.gov/

National Institute of Mental Health (NIMH)
http://www.nimh.nih.gov/

National Institutes of Health (NIH)
http://www.nih.gov/

National Library of Medicine (NLM)
http://www.nlm.nih.gov/

National Vaccine Program Office (NVPO)
http://www.hhs.gov/nvpo/

National Weather Service (NWS)
http://www.nws.noaa.gov/

Nuclear Regulatory Commission (NRC)
http://www.nrc.gov/

O

Occupational Safety and Health Administration (OSHA)
http://www.osha.gov/

Office for Domestic Preparedness (ODP)
http://www.ojp.usdoj.gov/odp/

Office of Public Health Emergency Preparedness (OPHEP)
http://www.hhs.gov/ophep/

Office of the Assistant Secretary for Public Affairs (OASPA)
http://www.hhs.gov/aspa/

P

Public Health Service (PHS)
http://www.usphs.gov/

R

Ready.Gov (from the U.S. Department of Homeland Security)
http://www.ready.gov/

S

Substance Abuse and Mental Health Services Administration (SAMHSA)
http://www.samhsa.gov/

B

U

U.S. Army Medical Research Institute for Infectious Diseases (USAMRIID)
http://www.usamriid.army.mil/

FEDERAL GOVERNMENT TOPICAL WEB SITES

A

Acute Radiation Syndrome (ARS)
http://www.bt.cdc.gov/radiation/ars.asp

Anthrax
http://www.bt.cdc.gov/agent/anthrax/

Arsine
http://www.bt.cdc.gov/agent/arsine/pdf/arsinefactsheet.pdf

B

Bio-Surveillance Initiatives
http://www.dhs.gov/dhspublic/display?theme=43&content=3092&print=true

Biological Weapons Convention
http://www.state.gov/t/ac/trt/4718.htm#treaty
http://www.state.gov/t/ac/trt/4718.htm#signatory

BioSense
http://www.syndromic.org/pdf/work3-JL-BioSense.pdf

BioShield
http://www.hhs.gov/news/press/2004pres/20040721b.html

Botulism
http://www.cdc.gov/ncidod/dbmd/diseaseinfo/botulism_g.htm

Brucellosis
http://www.cdc.gov/ncidod/dbmd/diseaseinfo/brucellosis_g.htm

C

Chemical Agent List
http://www.bt.cdc.gov/agent/agentlistchem.asp

Chemical Weapons Convention
http://www.state.gov/www/global/arms/treaties/cwctext.html

Chlorine
http://www.bt.cdc.gov/agent/chlorine/basics/pdf/chlorine-facts.pdf

Cholera
http://www.cdc.gov/ncidod/dbmd/diseaseinfo/cholera_g.htm

Clean Water Act
http://www.epa.gov/region5/water/cwa.htm

Cyanide
http://www.bt.cdc.gov/agent/cyanide/basics/pdf/cyanide-facts.pdf

D

Dirty Bombs
http://www.bt.cdc.gov/radiation/pdf/dirtybombs.pdf

Disaster Epidemiology and Assessment
http://www.cdc.gov/nceh/hsb/disaster/default.htm

E

Ebola
http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/ebola.htm

E. coli
http://www.cdc.gov/ncidod/dbmd/diseaseinfo/escherichiacoli_g.htm

Environmental Technology Verification Program (ETV)
http://www.epa.gov/etv/

Epidemic Information Exchange (Epi-X)
http://www.cdc.gov/epix/

Epidemic Intelligence Service (EIS)
http://www.cdc.gov/eis/

F

Federal Radiological Emergency Response Plan (FRERP)
http://www.fas.org/nuke/guide/usa/doctrine/national/frerp.htm

Foodborne Diseases Active Surveillance Network (FoodNet)
http://www.cdc.gov/foodnet/

Food Producers, Processors, and Transporters: Food Security Preventive Measures Guidance
http://vm.cfsan.fda.gov/~dms/secguid6.html

Food Safety and Inspection Service (FSIS) Security Guidelines for Food Processors
http://www.fsis.usda.gov/oa/topics/biosecurity2.htm

Food Safety Requirements of the Bioterrorism Act
http://www.fda.gov/oc/bioterrorism/bioact.html

Food Tampering
http://vm.cfsan.fda.gov/~dms/fstamper.html

G

Geneva Protocol
http://www.state.gov/www/global/arms/treaties/geneva1.html

H

Health Alert Network (HAN)
http://www.phppo.cdc.gov/han/

L

Laboratory Response Network (LRN)
http://www.bt.cdc.gov/lrn/pdf/lrnfactsheet.pdf

Lewisite
http://www.bt.cdc.gov/agent/lewisite/basics/pdf/lewisite-facts.pdf

N

National Bioterrorism Hospital Preparedness Program (NBHPP)
http://www.hrsa.gov/bioterrorism/

National Disaster Medical System (NDMS)
http://ndms.dhhs.gov/

National Electronic Disease Surveillance System (NEDSS)
http://www.cdc.gov/nedss/

National Incident Management System (NIMS)
http://www.dhs.gov/interweb/assetlibrary/NIMS-90-web.pdf

National Response Plan (NRP)
http://www.dhs.gov/nrp

Nuclear Blast
http://www.bt.cdc.gov/radiation/pdf/nuclearblastfaq.pdf

P

Pandemic Influenza
http://www.hhs.gov/nvpo/pandemics/index.html

Phosgene
http://www.bt.cdc.gov/agent/phosgene/basics/pdf/phosgene-facts.pdf

Plague
http://www.bt.cdc.gov/agent/plague

Potassium Iodide (KI)
http://www.bt.cdc.gov/radiation/pdf/ki.pdf

Public Health Security and Bioterrorism Preparedness and Response Act of 2002
http://thomas.loc.gov/cgi-bin/query/z?c107:H.R.3448.ENR:

Public Health Service Act (PHSA)
http://www.fda.gov/opacom/laws/phsvcact/phsvcact.htm

R

Radiation Emergencies
http://www.bt.cdc.gov/radiation

Radiation Emergency Assistance Center/Training Site (REAC/TS)
http://www.orau.gov/reacts

Radioactive Contamination and Radioactive Exposure
http://www.bt.cdc.gov/radiation/contamination.asp

Radiological Emergency Response
http://www.epa.gov/radiation/rert

Respirator Fact Sheet
http://www.cdc.gov/niosh/npptl/topics/respirators/factsheets/respfact.html

Retail Food Stores and Food Service Establishments: Food Security Preventive Measures Guidance
http://vm.cfsan.fda.gov/~dms/secguid5.html

Ricin
http://www.bt.cdc.gov/agent/ricin/facts.asp

S

Safe Drinking Water Act (SDWA)
http://www.epa.gov/safewater/sdwa/sdwa.html

Salmonellosis
http://www.cdc.gov/ncidod/dbmd/diseaseinfo/salmonellosis_g.htm

B

Sarin
http://www.bt.cdc.gov/agent/sarin/basics/pdf/sarin-facts.pdf

Select Agent Program (SAP)
http://www.cdc.gov/od/sap/

Severe Acute Respiratory Syndrome (SARS)
http://www.cdc.gov/ncidod/sars

Sheltering In Place—General
http://www.bt.cdc.gov/planning/Shelteringfacts.pdf

Sheltering In Place—Radiation
http://www.bt.cdc.gov/radiation/pdf/shelter.pdf

Shigellosis
http://www.cdc.gov/ncidod/dbmd/diseaseinfo/shigellosis_g.htm

Smallpox
http://www.bt.cdc.gov/agent/smallpox/disease/faq.asp

Soman
http://www.bt.cdc.gov/agent/soman/basics/pdf/soman-facts.pdf

Strategic National Stockpile (SNS)
http://www.bt.cdc.gov/stockpile/index.asp

Sulfur Mustard
http://www.bt.cdc.gov/agent/sulfurmustard/basics/pdf/sulfur-mustard-facts.pdf

T

Tabun
http://www.bt.cdc.gov/agent/tabun/basics/pdf/tabun-facts.pdf

Tularemia
http://www.bt.cdc.gov/agent/tularemia/facts.asp

V

Vulnerability Assessments
http://www.epa.gov/safewater/watersecurity/pubs/va_fact_sheet_12-19.pdf

VX
http://www.bt.cdc.gov/agent/vx/basics/pdf/vx-facts.pdf

W

Water Security Division
http://www.epa.gov/watersecurity

Water Security Requirements of the Bioterrorism Act
http://cfpub.epa.gov/safewater/watersecurity/bioterrorism.cfm

West Nile Virus (WNV)
http://www.cdc.gov/ncidod/dvbid/westnile/index.htm

OTHER WEB SITES

A

American Medical Association (AMA)
http://www.ama-assn.org/

American Medical Association, *Diagnosis and Management of Foodborne Illnesses: A Primer for Physicians and Other Health Care Professionals*
http://www.ama-assn.org/ama/pub/category/print/3629.html

American Press Institute (API)
http://www.americanpressinstitute.org/

American Red Cross (ARC)
http://www.redcross.org/

Association of Public Health Laboratories (APHL)
http://www.aphl.org/

Association of State and Territorial Health Officials (ASTHO)
http://www.astho.org/

C

Committee to Protect Journalists (CPJ)
http://www.cpj.org/

Council of State and Territorial Epidemiologists (CSTE)
http://www.cste.org/

I

Institute of Medicine, National Academy of Sciences (IOM)
http://www.iom.edu/

International Federation of Journalists (IFJ)
http://www.ifj.org/

International News Safety Institute (INSI)
http://www.newssafety.com/

M

Medical NBC Online Information Server (NBC-MED)
http://www.nbc-med.org

N

National Academy of Sciences (NAS)
http://www4.nationalacademies.org/nas/nashome.nsf

National Association of County and City Health Officials (NACCHO)
http://www.naccho.org/

National Disaster Education Coalition, The (NDEC)
http://www.disastereducation.org/

National Public Health Information Coalition (NPHIC)
http://www.nphic.org/

National Voluntary Organization Active in Disaster (NVOAD)
http://www.nvoad.org/

Nuclear Energy Institute (NEI)
http://www.nei.org/

P

Pan American Health Organization (PAHO)
http://www.paho.org/

S

South Central Center for Public Health Preparedness—Media Response to Bioterrorism and Other Threats to Public Health
http://mediaresponse.ua.edu

W

Water Terrorism
http://www.WaterHealthConnection.org/bt

World Health Organization (WHO), Communicable Disease Surveillance and Response Program (CSR)
http://www.who.int/csr/en

APPENDIX C. Epidemiology Glossary

This glossary of epidemiology terms was created to provide the media with accurate, straightforward definitions of epidemiology terms as they relate to terrorism. The glossary is adapted from several authoritative sources—including the U.S. Department of Health and Human Services' Centers for Disease Control and Prevention. Experts from state and federal health agencies have also provided assistance in simplifying these definitions to meet the needs of journalists.

EPIDEMIOLOGY TERMS

Agent: A germ, chemical, or type of radiation that can cause disease or damage to the human body.

Attack rate: Also known as case rate, is the proportion of the population who developed a disease or injury out of a particular group of people during a limited time period. The secondary attack rate is the proportion of the population who were around the initially affected people and who also ended up getting sick.

Case: A person in the population identified as having a particular disease, health disorder, or condition under investigation.

Case definition: A set of standard criteria, usually based on symptoms, timing, and laboratory results, used for deciding whether a person should be counted as having a particular disease or health-related condition.

Contraindications: Any physical or medical reason why a medicine or vaccine should not be given to an individual.

Epidemic: The occurrence of more cases of a disease than expected in a given area or among a specific group of people over a particular period of time.

Epidemic curve: A histogram (chart) that shows the course of a disease outbreak or epidemic by plotting the number of cases by time of onset.

Exposure: Contact with an agent by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term (acute exposure), of intermediate duration, or long-term (chronic exposure).

False negative: When, due to a negative test result, a person who actually has the disease or condition in question is not counted as a case.

False positive: When, due to a positive test result, a person who does not have the disease or condition in question is counted as a case.

Host: Any person or other living thing that can be infected by an agent that causes disease.

Incidence: The number of new cases of a disease in a defined population over a specific time period.

Incubation period: The time period from when a person gets infected to when the first signs or symptoms of the disease occur.

Index case: The first case that is known to investigators or researchers. Determining the index case can be helpful in tracing the origins of a disease outbreak.

Infection: Invasion and multiplication of living agents (bacteria, fungi, viruses) that cause disease in body tissues. Infection does not necessarily lead to illness.

Infectiousness: How easy it is for an infection to spread to another living thing.

Immunization: The process of introducing weakened or killed germs or toxins into the body to induce the immune system to produce protective antibodies that will destroy the disease causing agent if it enters the body at a later date. Immunization is also known as vaccination.

Morbidity: Illness.

Mortality: Death. Usually the cause (a specific disease, a condition, or an injury) is stated.

Pandemic: An epidemic occurring over a very wide area (usually multicountry) and usually affecting a large proportion of the population.

Pathogen: An organism capable of causing disease.

Prevalence: The number of cases of a given disease or other condition in a given population at a designated time.

Screening: The use of tests or examinations to identify unrecognized disease. Positive screening tests may require further examination and/or testing to confirm disease.

Sensitivity: The ability of a test to detect the proportion of people with the disease who have a true positive test result. The higher the sensitivity, the greater the detection rate and the lower the false negative rate.

Specificity: The ability of a test to detect the proportion of people without the disease who have a true negative test result. The higher the specificity, the lower the false positive rate and the lower the proportion of people who have the disease who will be unnecessarily worried or exposed to unneeded treatment.

Surveillance: Collecting information on cases of disease or other conditions in a standard way to detect increases or decreases in disease over time and differences between various geographic areas. Public health officials use the information to detect outbreaks and to plan programs to help prevent and control disease.

Vaccination: See immunization.

ADDITIONAL RESOURCES

Agency for Toxic Substances Disease Registry. ATSDR Glossary of Terms: http://www.atsdr.cdc.gov/glossary.html.

Centers for Disease Control and Prevention. "Crisis and Emergency Risk Communication," September 2002.

Centers for Disease Control and Prevention. Glossary of Epidemiology Terms: http://www.cdc.gov/reproductivehealth/EpiGlossary/glossary.htm.

University of Toronto, Centre for Evidence-Based Medicine, University Health Network. http://www.cebm.utoronto.ca/glossary/.

APPENDIX D. Descriptions of Selected Sections of Acts Related to Public Health Emergencies

This appendix includes sections of the Public Health Service Act; the Social Security Act; the Federal Food, Drug, and Cosmetic Act; and the Public Health Security and Bioterrorism Preparedness and Response Act.

TABLE 1: SPECIFIC SECTIONS OF THE PUBLIC HEALTH SERVICE ACT

TITLE/SECTION	KEY POINTS	DESCRIPTION
42 U.S.C. § 247(d) **Declaration of a Public Health Emergency**	Provides authority to: • Declare a public health emergency and take action • Make grants • Provide expense awards • Enter into contracts • Conduct/support investigations about prevention and treatment	The Secretary of the U.S. Department of Health and Human Services (HHS) may declare a public health emergency and take appropriate actions, including making grants, providing awards for expenses, entering into contracts, and conducting/supporting investigations into the cause, prevention, or treatment of the disease or disorder that presents the emergency.
42 U.S.C. § 203–204, 214–216 **Commissioned Corps and PHS Personnel** *(http://www.usphs.gov)*	• Commissioned Corps (regular and reserved) established for duty • Public health personnel can be detailed	The Commissioned Regular Corps and a Commissioned Reserve Corps are established for duty in time of emergency. Public health personnel can be detailed to other federal departments or to state health and mental health authorities.
42 U.S.C. § 233 **Defense of Certain Malpractice and Negligence Suits, Smallpox Compensation**	• Provides remedies for malpractice and negligence claims against the Public Health Service (PHS) under the Federal Tort Claims Act	Provides that remedies under the Federal Tort Claims Act are the exclusive remedy for malpractice and negligence claims against Commissioned Corps officers and employees of PHS.
42 U.S.C. § 241 **Research and Development**	• Provides authority to conduct and support health research	The Secretary is authorized to conduct and support research and studies relating to the causes, diagnosis, treatment, control, and prevention of physical and mental diseases.
42 U.S.C. § 247(d)-6(h) **Accelerated Research and Development on Priority Pathogens and Countermeasures**	• Provides authority to prioritize counter terrorism research • Secretary may designate counterterrorism medical products for priority review	The Secretary may give priority funding to research related to countermeasures to pathogens of potential use in a bioterrorist attack or other agents that may cause a public health emergency. The Secretary may designate medical products for counterterrorism for priority review.
42 U.S.C. § 264 **Prevention of Communicable Diseases**	• Provides authority to quarantine or conditionally release individuals to prevent transmission of infectious diseases	Executive Order 13295 (4/4/03) permits the apprehension, detention, or conditional release of individuals to prevent transmission of cholera, diphtheria, infectious tuberculosis, plague, smallpox, yellow fever, viral hemorrhagic fevers, and severe acute respiratory syndrome (SARS). The Secretary may quarantine individuals arriving into the United States, moving from one state or possession into another, or when individuals are a probable source of infection to other individuals moving between states.
42 U.S.C. § 243 **Quarantine Enforcement and Temporary Assistance to States**	• Local and state authorities may assist in enforcing federal regulations of quarantine • The Secretary may aid local and state authorities in enforcing quarantines	The Secretary may accept assistance from local and state authorities in the enforcement of federal regulations of quarantine and to aid the local and state authorities in the enforcement of their quarantine or other prevention or suppression of communicable diseases.

TABLE 1: SPECIFIC SECTIONS OF THE PUBLIC HEALTH SERVICE ACT *(cont.)*

TITLE/SECTION	KEY POINTS	DESCRIPTION
42 U.S.C. § 265 **Prohibition of Entry and Imports**	• The Secretary may prohibit entry of individuals or property into the United States in the interest of public health	If there is a serious danger of a communicable disease in a foreign country being introduced into the United States, in the interest of public health to avert such danger and in accordance with regulations approved by the President, the Secretary can prohibit people or property from entering the country.
42 U.S.C. § 266 **War-Time Quarantine**	• Provides authority to apprehend and provide examination of any individual suspected likely to be a source of infection to military or war workers	In time of war, to protect the military and war workers of the United States against specified communicable diseases, the Secretary, in consultation with the Surgeon General, is authorized to provide for the apprehension and examination of any individual believed to be infected with such disease and likely to be a source of infection to members of the armed forces or war workers.
42 U.S.C. § 267(a) **Quarantine Stations**	• The Secretary controls, directs, and manages all quarantine stations • The Secretary designates quarantine borders	The Secretary shall control, direct, and manage all U.S. quarantine stations, designate their boundaries, and designate the quarantine officers to be in charge.
42 U.S.C. § 249 **Care and Treatment for Persons Under Quarantine**	• PHS cares for person under quarantine • PHS pays expenses for treatment	PHS is responsible for the care and treatment of persons under quarantine or the expense of their treatment and care in public or private medical facilities if authorized by the officer in charge of the quarantine station.
42 U.S.C. § 248 **Establishment of Hospitals**	• The Secretary may operate PHS hospitals	The Secretary is able to operate PHS hospitals, including the management of hospitals, treatment of patients, transfer of patients between hospitals, disposal of articles produced by patients in the course of treatment, and disposal of money and effects of deceased patients.
42 U.S.C. § 290(aa) **Crisis Counseling**	• Provides for awards to public entities to address emergency substance abuse or mental health needs	The Secretary may make awards to public entities to address emergency substance abuse or mental health needs.
42 U.S.C. § 300 (hh)–12 **Pharmaceutical Stockpile**	• Provides for maintenance of a stockpile of medical supplies and drugs for U.S. emergency health security	The Secretary of the U.S. Department of Homeland Security, in coordination with the Secretary of HHS and the Secretary of Veterans Affairs, may maintain a stockpile of drugs, vaccines, and other biological products, medical devices, and other supplies in such numbers, types, and amounts as are determined by the Secretary of HHS to be appropriate and practicable to provide for the emergency health security of the United States, including children and other vulnerable populations.
42 U.S.C. § 262 **Regulation of Biological Products**	• No person may introduce biological products into interstate commerce without a license, label, manufacturing identity, and expiration date	No person may introduce or deliver for introduction into interstate commerce any biological product unless it is licensed and plainly marked with the name, identity of manufacturer, and expiration date.
42 U.S.C. § 242(p) **National Disease Prevention Data Profile**	• The Secretary must compile and disseminate a national disease prevention profile to provide a database for emergencies • Database includes morbidity rates and profiles of population segments	The Secretary must compile and disseminate a national disease prevention data profile to provide a database for use in an emergency situation. This database includes such items as morbidity rates for diseases and health profiles on segments of the population.

TABLE 1: SPECIFIC SECTIONS OF THE PUBLIC HEALTH SERVICE ACT *(cont.)*

TITLE/SECTION	KEY POINTS	DESCRIPTION
42 U.S.C. § 247(d)-1 **National Needs to Combat Threats to Public Health**	• Provides authority to improve/expand response capacities of local, state, and national public health agencies	The Secretary is authorized to establish reasonable capacities to improve, enhance, or expand the abilities of local, state, and national public health agencies to detect and respond to public health threats.
42 U.S.C. § 247(d)-2 **Assessment of Public Health Needs**	• Provides authority to award grants to perform evaluations of the response capabilities of local and state public health agencies	The Secretary is authorized to award grants to perform evaluations of the capabilities of local and state public health agencies to respond to public health threats.
42 U.S.C. § 300(hh) **Public Health Response and Recovery Preparations**	• Provides authority to develop and implement a state-coordinated strategy for planning and responding to emergencies • Provides authority to develop and implement an emergency response plan and assist local and state governments	The Secretary is authorized to develop and implement a coordinated strategy for carrying out health-related preparations, response, and recovery to public health emergencies and do so in coordination with states. The Secretary is also authorized to develop and implement a preparedness and response plan and provide effective assistance to local and state governments to ensure that they have the appropriate capabilities to coordinate emergency response.
42 U.S.C. § 300(ff)-81 **Protection of Emergency Response Workers**	• Provides authority to create a list of life-threatening infectious diseases to protect first responders	The Secretary is authorized to complete a detailed list of potentially life-threatening infectious diseases to which emergency response workers may be exposed in responding to emergencies.
42 U.S.C. § 247-7c **Supplies and Equipment**	• The Secretary may provide supplies and equipment for HHS, local, and state agencies in response to emergencies	The Secretary may provide supplies, equipment, and services and detail HHS officers and employees to deal with, among other things, action in response to public health emergencies and support capacity building of local and state public health systems to detect and respond to public health threats.
42 U.S.C. § 247(d)-6(g)(1) **Emergency Response Personnel Training**	• Provides authority to develop educational and training materials for public health and medical professionals • The Secretary may develop curricula for proficiency testing of laboratory testing for bioweapons	The Secretary is authorized to develop teaching materials and curricula to be given to public health officials, medical professionals, and other personnel working in health care facilities for the following reasons: (1) for identifying potential bioweapons and other agents that may create a public health emergency, describing the care of victims of such an emergency, and recognizing the special needs of children and other vulnerable populations; (2) for community-wide planning by local and state governments, health care facilities, and appropriate public and private sector entities to respond to a bioterrorist attack or other public health emergency; and (3) for proficiency testing of laboratory and other public health personnel for the recognition and identification of potential bioweapons and other agents that may create a public health emergency.
42 U.S.C. § 247(d)-7b **Credentialing of Health Professionals**	• Provides authority to maintain a system of credentialing for health professionals • The Secretary may encourage states to provide authority to health professionals authorized in another state to practice in the state	The Secretary is authorized to maintain a system for advance registration of health professionals to verify credentials, licenses, accreditations, and hospital privileges when such professionals volunteer to provide services during public health emergencies. The Secretary may encourage, but not require, each state to provide legal authority during a public health emergency for health professionals authorized in another state to provide such services in the state.

TABLE 1: SPECIFIC SECTIONS OF THE PUBLIC HEALTH SERVICE ACT *(cont.)*

TITLE/SECTION	KEY POINTS	DESCRIPTION
42 U.S.C. § 300(aa)-10 **National Vaccine Injury Compensation Program**	• Establishment of the National Vaccine Injury Compensation Program	This section establishes the National Vaccine Injury Compensation Program, administered by the Secretary, under which compensation may be paid for a vaccine-related injury or death from covered childhood vaccines.
42 U.S.C. 247(d)-3a **Improvement of Hospital Preparedness**	• Provides authority to award grants to develop and implement regional plans to improve hospital and health system capacity to respond to terrorism and other public health emergencies	The Secretary is authorized to award grants to states and other entities to develop and implement regional plans to improve the capacity of hospitals and other health system components to respond to incidents requiring mass immunization, isolation, decontamination, diagnosis, and treatment in the aftermath of terrorism or other public health emergencies.

TABLE 2: SPECIFIC SECTION OF THE SOCIAL SECURITY ACT

TITLE/SECTION	KEY POINTS	DESCRIPTION
42 U.S.C. § 1320(b)-5 **Waiver of Medicare, Medicaid, or SCHIP Requirements**	• The Secretary may ensure that health services are available for Medicare, Medicaid, and SCHIP enrollees • Health care personnel who cannot comply with program requirements yet provide services will be reimbursed and exempt from sanctions	The Secretary may ensure, to the maximum extent feasible, that health care services are available to meet the needs of individuals enrolled in the Medicare, Medicaid, and SCHIP programs. Health care personnel who provide services in good faith but are unable to comply with specific program requirements are reimbursed and exempted from sanctions for noncompliance, save for fraud or abuse.

TABLE 3: SPECIFIC SECTIONS OF THE FEDERAL FOOD, DRUG, AND COSMETIC ACT

TITLE/SECTION	KEY POINTS	DESCRIPTION
21 U.S.C. § 334 **Detention of Food; Seizure of Food**	• HHS and the Food and Drug Administration (FDA) may detain food if there is credible evidence of an adverse health consequence • The United States may seize adulterated food introduced into the interstate commerce or obtained by the U.S. Customs and Border Protection	FDA may, by Administrative Order, detain food (which includes live food animals) for up to 30 days if it has credible evidence that it presents a threat of serious adverse health consequences or death to humans or other animals. The United States may seize any adulterated article of food that has been introduced into interstate commerce or in the custody of the U.S. Customs and Border Protection.
42 U.S.C. 247(d)-3a **Improvement of Hospital Preparedness**	• Provides authority to award grants to develop and implement regional plans to improve hospital and health system capacity to respond to terrorism and other public health emergencies	Food is adulterated if it bears or contains any added poisonous or deleterious substance that may render it injurious to health; is unfit for food; or has been prepared, packed, or held under unsanitary conditions, whereby it may have been rendered injurious to health.

TABLE 3: SPECIFIC SECTIONS OF THE FEDERAL FOOD, DRUG, AND COSMETIC ACT *(cont.)*

TITLE/SECTION	KEY POINTS	DESCRIPTION
21 U.S.C. § 350(c), 372, 374 **Inspections and Investigations**	• Provides authority to inspect food facilities and vehicles used in all points of food production	FDA is authorized to inspect any location or vehicle where foods are manufactured, processed, packed, or held for introduction into interstate commerce or after such introduction, and this inspection extends to records of such persons (excluding farms and restaurants) who manufacture, process, pack, transport, distribute, hold, or import food when HHS/FDA has a reasonable belief that the food is adulterated and presents a threat of serious adverse health consequences or death to humans or animals.
21 U.S.C. § 381 **Imports and Exports**	• The United States may refuse all foods or cosmetics that appear to be adulterated	Imports of food or cosmetics that appear to be adulterated are subject to refusal of admission to the United States.

TABLE 4: SPECIFIC SECTIONS OF THE PUBLIC HEALTH SECURITY AND BIOTERRORISM PREPAREDNESS AND RESPONSE ACT

TITLE/SECTION	KEY POINTS	DESCRIPTION
Title I: National Preparedness for Bioterrorism and Other Public Health Emergencies	• Federal, state, and local coordination • Strategic National Stockpile • Improving state, local, and hospital preparedness	Directs the Secretary to further develop and implement a coordinated strategy for carrying out health-related activities to prepare for and respond to bioterrorism or other public health emergencies. Provides support for the National Disaster Medical System, an integrated system of public health alert communication and surveillance; Strategic National Stockpile; and development of priority countermeasures. The act also requires grants for state- and community-wide plans for responding to bioterrorism or other public health emergencies; to address deficiencies in those plans; to provide materials, training, surveillance, and detection and communication systems; and to support state, local, and hospital preparedness. Expands authority of the Secretary, under certain conditions, to specify communicable diseases subject to individual detention orders.
Title II-Subtitle A: Enhancing Controls on Dangerous Biological Agents and Toxins	• Provides for enhanced control of certain biological agents and toxins	Directs the Secretary to establish a list of biological agents and toxins with potential to pose a severe threat to public health and safety. Regulates transfer of those agents. Requires standards and procedures for their use, registration for their use, and safeguards and security requirements for their possession, use, or transfer.
Title III: Protecting Safety and Security of Food and Drug Supply	• Protects imported foods • Requires linkages across federal agencies and with states and tribal governments to protect the food supply • Establishes research to improve food safety testing • Requires regulation of foreign drug manufacturers and importers	Directs the Secretary to increase port inspections of foods and extends authority of FDA to temporarily detain food that may present a serious threat to humans or animals. Improves FDA information management systems relating to imported foods. Improves linkages with other federal regulatory agencies dealing with food safety and state and Indian tribes. Provides research to develop tests and methodologies to rapidly detect adulteration of food. Mandates the annual registration of foreign manufacturers engaged in food import into the United States.

APPENDIX E. Family Disaster Planning—Five Steps to Safety

1. Find Out What Could Happen to You

- Contact your local American Red Cross chapter or emergency management office before a disaster occurs—be prepared to take notes.
- Ask what types of disasters are most likely to happen. Request information on how to prepare for each.
- Learn about your community's warning signals: what they sound like and what you should do when you hear them.
- Ask about animal care after a disaster. Animals are not allowed inside emergency shelters because of health regulations.
- Find out how to help elderly or disabled persons, if necessary.
- Find out about the disaster plans at your workplace, your children's school or day care center, and other places where your family spends time.

2. Create a Disaster Plan

- Meet with your family and discuss why you need to prepare for disaster. Explain the dangers of fire, severe weather, and earthquakes to children. Plan to share responsibilities and work together as a team.
- Discuss the types of disasters that are most likely to happen. Explain what to do in each case.
- Pick two places to meet:
  - Right outside your home in case of a sudden emergency, like a fire.
  - Outside your neighborhood in case you cannot return home. Everyone must know the address and phone number.
- Ask an out-of-state friend to be your "family contact." After a disaster, it is often easier to call long distance than locally. Family members should call this person after an event and tell them where they are. Everyone must know your contact's phone number.
- Discuss what to do in an evacuation. Plan how to take care of your pets.

3. Complete the Following Tasks

- Post emergency telephone numbers by telephones (fire, police, ambulance, school, etc.).
- Post the addresses and phone numbers for at least three nearby hospitals (one near home, one near work, one near your child's school).
- Teach children how and when to call 9–1–1 or your local Emergency Medical Services number for emergency help.
- Show each family member how and when to turn off the utilities (water, gas, and electricity) at the main switches.
- Check to see if you have adequate insurance coverage.
- Get training from the fire department for each family member on how to use the household fire extinguishers (ABC type) and show everyone where you keep them.
- Install smoke detectors on each level of your home, especially near bedrooms.
- Conduct a home hazard hunt.
- Stock emergency supplies and assemble a disaster supplies kit (see appendix F).
- Take an American Red Cross first aid and cardiopulmonary resuscitation (CPR) class.
- Determine the best escape routes from your home. Find two ways out of each room.
- Find the safe places in your home for each type of disaster.

4. Make Sure That You Have All Essential Personal Information for You and Each Member of Your Family

- Blood types
- Allergies
- Medications
- Past and current medical conditions (e.g., diabetes, high blood pressure)
- Immunization history
- Names and numbers for family physicians

(It may be helpful to put this information in a document, along with a photo ID. If there are mass immunizations or medicine distributions in your community, you may need a photo ID for each member of your family.)

5. Practice and Maintain Your Plan

- Quiz your children every 6 months or so.
- Conduct fire and emergency evacuations.
- Replace stored water and stored food every 6 months.
- Test and recharge your fire extinguisher(s) according to manufacturer's instructions.
- Test your smoke detectors monthly and change the batteries at least once a year.

Based on the "Your Family Disaster Plan" developed by the Federal Emergency Management Agency (http://www.fema.gov) and American Red Cross (http://www.redcross.org).

REFERENCE

Federal Emergency Management Agency, & American Red Cross. (2004). Your family disaster plan. http://www.fema.gov/pdf/library/yfdp.pdf.

APPENDIX F. Disaster Supplies Kit

There are six basics that you should stock for your home: water, food, first aid kit, clothing and bedding, tools and emergency supplies, and special items. Keep the items that you would most likely need during an evacuation in an easy-to-carry container—suggested items are marked with an asterisk(*) in the list below. Possible containers include a large, covered trash container; a camping backpack; or duffelbag.

WATER

Store water in plastic containers, such as soft drink bottles. Avoid using containers that will decompose or break, such as milk cartons or glass bottles. A normally active person needs to drink at least 2 quarts of water each day. Hot environments and intense physical activity can double that amount. Children, nursing mothers, and ill people will need more.

- Store 1 gallon of water per person per day. (2 quarts for drinking, 2 quarts for each person in your household for food preparation/sanitation).*
- Keep at least a 3-day supply of water per person.

FOOD*

Store at least a 3-day supply of nonperishable food. Select foods that require no refrigeration, preparation, or cooking and little or no water. If you must heat food, pack a can of sterno. Select food items that are compact and lightweight. Include a selection of the following foods in your disaster supplies kit:

- Ready-to-eat canned meats, fruits, and vegetables
- Canned juices
- Staples (salt, sugar, pepper, spices, etc.)
- High energy foods
- Vitamins
- Food for infants and elderly
- Comfort/stress foods

FIRST AID KIT*

Assemble a first aid kit for your home and one for each car.

- Twenty adhesive bandages, various sizes
- One 5” x 9” sterile dressing
- One conforming roller gauze bandage
- Two triangular bandages
- Two 3” x 3” sterile gauze pads
- Two 4” x 4” sterile gauze pads
- One roll 3” cohesive bandage
- Two germicidal hand wipes or waterless alcohol-based hand sanitizer
- Six antiseptic wipes
- Two pairs of large medical grade nonlatex gloves
- Adhesive tape, 2” width
- Antibacterial ointment
- Cold pack
- Scissors (small, personal)
- Tweezers
- Cardiopulmonary resuscitation (CPR) breathing barrier, such as a face shield

NONPRESCRIPTION DRUGS

- Aspirin or nonaspirin pain reliever
- Antidiarrhea medication
- Antacid (for stomach upset)
- Syrup of Ipecac (use to induce vomiting, if advised by the Poison Control Center)
- Laxative
- Activated charcoal (use if advised by the Poison Control Center)

CLOTHING AND BEDDING

Include at least one complete change of clothing and footwear per person.*

- Sturdy shoes or work boots*
- Rain gear*
- Blankets or sleeping bags*
- Hat and gloves
- Thermal underwear
- Sunglasses

F

TOOLS AND EMERGENCY SUPPLIES

- Mess kits, or paper cups and plates, and plastic utensils*
- Emergency preparedness manual*
- Battery-operated radio and extra batteries*
- Flashlight and extra batteries*
- Cash or traveler's checks and change*
- Nonelectric can opener and utility knife*
- Fire extinguisher: small canister ABC type
- Tube tent
- Pliers
- Tape
- Compass
- Matches in a waterproof container
- Aluminum foil
- Plastic storage containers
- Signal flare
- Paper and pencil
- Needles and thread
- Medicine dropper
- Shutoff wrench (to turn off household gas and water)
- Whistle
- Plastic sheeting
- Map of the area (for locating shelters)

SANITATION

- Toilet paper and towelettes*
- Soap and liquid detergent*
- Feminine supplies*
- Personal hygiene items*
- Plastic garbage bags and ties (for personal sanitation uses)
- Plastic bucket with tight lid
- Disinfectant
- Household chlorine bleach (may also be used for purifying drinking water—see http://www.redcross.org for instructions)

SPECIAL ITEMS

Remember family members with special requirements, such as infants and elderly or disabled persons.

FOR BABY*

- Formula
- Diapers
- Bottles
- Powdered milk
- Medications

FOR ADULTS*

- Heart and high blood pressure medication
- Insulin
- Prescription drugs
- Denture needs
- Contact lenses and supplies
- Extra eye glasses

ENTERTAINMENT

- Games, playing cards, and books

IMPORTANT FAMILY DOCUMENTS

Keep these records in a waterproof, portable container:

- Will, insurance policies, contracts deeds, stocks and bonds
- Passports, social security cards, immunization records
- Bank account numbers
- Credit card account numbers and companies
- Inventory of valuable household goods and important telephone numbers
- Family records (birth, marriage, and death certificates)

STORAGE

- **Store your kit in a convenient place known to all family members. Keep a smaller version of the supplies kit in the trunk of your car.**
- **Keep items in airtight plastic bags. Change your stored water supply every 6 months so it stays fresh. Also, replace your stored food every 6 months. Rethink your kit and family needs at least once a year. Replace batteries, update clothes, etc.**
- **Ask your physician or pharmacist about storing prescription medications.**

Based on the "Your Family Disaster Supplies Kit" developed by the Federal Emergency Management Agency (http://www.fema.gov) and the American Red Cross (http://www.redcross.org). Additional supply checklists can also be found at http://www.ready.gov.

REFERENCE

Federal Emergency Management Agency, & American Red Cross. (2004). Your family disaster supplies kit. http://www.fema.gov/pdf/library/fdsk.pdf.

APPENDIX G. Personal Workplace Disaster Supplies Kit

In the workplace, where you might be confined for several hours or perhaps overnight, you may need the following supplies.

FLASHLIGHT WITH EXTRA BATTERIES

Use the flashlight to find your way if the power is out. Do not use candles or any other open flame for emergency lighting.

BATTERY-POWERED RADIO WITH EXTRA BATTERIES

News about the emergency may change rapidly as events unfold. You will also be concerned about family and friends in the area. Radio reports will give information about the areas most seriously affected.

FOOD

Enough nonperishable food to sustain you for at least 1 day (three meals) is a good idea. Select foods that require no refrigeration, preparation, or cooking and little or no water. Suggested items include:

- Ready-to-eat canned meals, meats, fruits, and vegetables
- Canned juices
- High-energy foods (granola bars, energy bars, etc.)

WATER

Keep at least 1 gallon of water available, more if you are on medications that require water or increase thirst. Store water in plastic containers, such as soft drink bottles, not ones that will decompose or break, such as milk cartons or glass bottles.

MEDICATIONS

Include any nonprescription medications you usually take, including pain relievers, stomach remedies, and so forth.

If you use prescription medications, keep at least a 3-day supply at your workplace. Consult with your physician or pharmacist about how to store these medications and talk to your employer about any storage concerns.

FIRST AID SUPPLIES

If your employer does not provide first aid supplies, have the following essentials:

- Twenty adhesive bandages, various sizes
- One 5” x 9” sterile dressing
- One conforming roller gauze bandage
- Two triangular bandages
- Two 3” x 3” sterile gauze pads
- Two 4” x 4” sterile gauze pads
- One roll 3” cohesive bandage
- Two germicidal hand wipes or waterless alcohol-based hand sanitizer
- Six antiseptic wipes
- Six pair large medical grade nonlatex gloves
- Adhesive tape, 2” width
- Antibacterial ointment
- Cold pack
- Scissors (small, personal)
- Tweezers
- CPR breathing barrier, such as a face shield

TOOLS AND SUPPLIES

- Emergency “space” blanket (mylar)
- Paper plates and cups, plastic utensils
- Nonelectric can opener
- Personal hygiene items, including a toothbrush, toothpaste, comb, brush, soap, contact lens supplies, and feminine supplies
- Plastic garbage bags and ties (for personal sanitation uses)
- One complete change of clothing and footwear, including a long-sleeved shirt, long pants, and closed-toed shoes or boots
- An extra pair of eyeglasses, if you wear them

GENERAL INFORMATION

- Adjust your kit according to your own personal needs.
- Do not include candles, weapons, toxic chemicals, or controlled drugs unless prescribed by a physician.

TOOLS FOR WORK

You may wish to have some additional tools in case you are working during an emergency. These may include:

- Police scanner
- Binoculars
- Walkie-talkies
- Whistle
- Lighter
- Waterproof pouches

Based on the "Your Family Disaster Supplies Kit" developed by the Federal Emergency Management Agency (http://www.fema.gov) and the American Red Cross (http://www.redcross.org).

TIP

PREPARING FOR POWER OUTAGE

Consider buying a "power inverter" from an electronics store. You can plug the inverter into the power outlet in your car and it will allow you to run a laptop and portable printer with the car running (of course, in a well-ventilated area—not a garage). A car cell-phone charger is also helpful.

REFERENCE

Federal Emergency Management Agency, & American Red Cross. (2004). Your family disaster supplies kit. http://www.fema.gov/pdf/library/fdsk.pdf.

APPENDIX H. Self-Monitoring Checklist

Developed by the U.S. Department of Health and Human Services' Substance Abuse and Mental Health Services Administration, this checklist is a useful tool for measuring stress levels during and following a public health emergency. Check off anything that pertains to feelings, thoughts, or behaviors in the last 24–48 hours. Experiencing a few of these symptoms may not be a problem, but experiencing several from each category may indicate the need to reduce stress.

BEHAVIORAL

- ❑ I am more or less active than normal.
- ❑ I am not as effective or efficient as usual.
- ❑ People do not seem to understand what I am trying to say.
- ❑ I feel irritable or angry all the time.
- ❑ I cannot seem to rest, relax, or calm down.
- ❑ I am eating a lot more/less than usual.
- ❑ I have trouble sleeping/am sleeping too much.
- ❑ I cry a lot or feel like crying all the time.
- ❑ I am drinking or smoking more than I usually do.

PHYSICAL

- ❑ My heart seems to beat fast all the time.
- ❑ I have an upset stomach, nausea, or diarrhea more often than normal.
- ❑ I have been gaining/losing a lot of weight.
- ❑ I perspire more than normal or often have chills.
- ❑ I have been having headaches.
- ❑ I have sore or aching muscles.
- ❑ My eyes are more sensitive to light.
- ❑ I have lower back pain.
- ❑ I feel there is a "lump in my throat" all the time.
- ❑ I jump at loud noises or when people come up behind me.
- ❑ I sleep okay, but I am still tired.
- ❑ I cannot get rid of this cold/I feel I am coming down with the flu.
- ❑ My allergies, asthma, arthritis, or other chronic health condition(s) have been bothering me more than usual.

PSYCHOLOGICAL/EMOTIONAL

- ❑ I have been on a natural high/an adrenaline rush for days.
- ❑ I often feel anxious or fearful.
- ❑ I cannot keep my mind on my work.
- ❑ I feel sad, moody, or depressed.
- ❑ I have been having disturbing dreams.
- ❑ I feel guilty about what the survivors are going through.
- ❑ I feel overwhelmed, helpless, or hopeless.
- ❑ I feel isolated, lost, or alone.
- ❑ No one seems to understand or appreciate me.

COGNITIVE

- ❑ I am having trouble remembering things.
- ❑ I get confused easily.
- ❑ I cannot figure things out as quickly as I usually do.
- ❑ I keep making mistakes or cannot make decisions well.
- ❑ I have trouble concentrating.
- ❑ I cannot quit thinking about the disaster or incident.

SOCIAL

- ❑ I do not want to be around people.
- ❑ I do not want to listen to people.
- ❑ Trying to work with the group seems like a waste.
- ❑ I do not like to ask for help.
- ❑ People seem so slow or unresponsive.

REFERENCE

Carter, N.C. (2001, draft). *Stress management handbook for disaster response and crisis response personnel.* Rockville, MD: Center for Mental Health Services, Substance Abuse and Mental Health Services Administration, U.S. Department of Health and Human Services.

APPENDIX I. Reducing Stress and Renewing Energy

- Take a walk or stretch.
- Stop and breathe deeply for a few moments.
- Talk to a trusted friend about your situation.
- Eat nutritious foods (e.g., lean protein, whole grains, fruits, and vegetables) and avoid sugar, caffeine, and alcohol.
- Take a hot bath.
- Read a humorous or interesting book on a topic completely unrelated to what you are dealing with.
- Sit in a dark room for a few minutes to help relieve headaches.
- Get to sleep early, if possible.
- Be patient with yourself.
- Ask people who have been through a similar experience how they handled their stress.
- Get a friend to partner with you for stress monitoring and reduction.
- If you feel lonely or isolated, ask someone to go to dinner or a movie.
- Meditate.
- Exercise.
- Spend some time with friends, family, and/or pets.

REFERENCE

Carter, N.C. (2001, draft). *Stress management handbook for disaster response and crisis response personnel.* Rockville, MD: Center for Mental Health Services, Substance Abuse and Mental Health Services Administration, U.S. Department of Health and Human Services.

APPENDIX J. Helping Children and Adolescents Cope With Violence and Disasters

The U.S. Department of Health and Human Services' (HHS) National Institute of Mental Health (NIMH) and other federal agencies are working to address the issue of assisting children and adolescents who have been victims of or witnesses to violent and/or catastrophic events. The purpose of this fact sheet is to tell what is known about the impact of violence and disasters on children and adolescents and suggest steps to minimize long-term emotional harm.

In the aftermath of the September 11 terrorist attacks on New York City and Washington, DC, both adults and children struggled with the emotional impact of such large-scale damage and losses of life. Other major acts of violence that have been felt across the country include the 1995 bombing of the Alfred P. Murrah Federal Building in Oklahoma City and the 1999 shootings at Columbine High School in Littleton, Colorado. While these disastrous events have caught the nation's attention, they are only a fraction of the many tragic episodes that affect children's lives. Each year, many children and adolescents sustain injuries from violence, lose friends or family members, or are adversely affected by witnessing a violent or catastrophic event. Each situation is unique, whether it centers upon a plane crash where many people are killed, automobile accidents involving friends or family members, or natural disasters, such as the Northridge, California earthquake (1994) or Hurricane Floyd (1999), where deaths occur and homes are lost—but these events have similarities as well and cause similar reactions in children. Even in the course of everyday life, exposure to violence in the home or on the streets can lead to emotional harm.

Research has shown that both adults and children who experience catastrophic events show a wide range of reactions (Smith & North 1993; Yehuda et al. 1998). Some suffer only worries and bad memories that fade with emotional support and the passage of time. Others are more deeply affected and experience long-term problems. Research on posttraumatic stress disorder (PTSD) shows that some soldiers; survivors of criminal victimization, torture and other violence; and survivors of natural and man-made catastrophes suffer long-term effects from their experiences. Children who have witnessed violence in their families, schools, or communities are also vulnerable to serious long-term problems. Their emotional reactions, including fear, depression, withdrawal, or anger, can occur immediately or sometime after the tragic event. Youngsters who have experienced a catastrophic event often need support from parents and teachers to avoid long-term emotional harm. Most will recover in a short time, but the few who develop PTSD or other persistent problems need treatment.

TRAUMA—WHAT IS IT?

"Trauma" has both a medical and a psychiatric definition. Medically, "trauma" refers to a serious or critical bodily injury, wound, or shock. This definition is often associated with trauma medicine practiced in emergency rooms and represents a popular view of the term. Psychiatrically, "trauma" has assumed a different meaning and refers to an experience that is emotionally painful, distressful, or shocking, which often results in lasting mental and physical effects.

Psychiatric trauma, or emotional harm, is essentially a normal response to an extreme event. It involves the creation of emotional memories about the distressful event that are stored in structures deep within the brain. In general, it is believed that the more direct the exposure to the traumatic event, the higher the risk for emotional harm (March et al. 1997). Thus, in a school shooting, for example, the student who is injured probably will be most severely affected emotionally; and the student who sees a classmate shot, even killed, is likely to be more emotionally affected than the student who was in another part of the school when the violence occurred. But even second-hand exposure to violence can be traumatic. For this reason, all children and adolescents exposed to violence or a disaster, even if only through graphic media reports, should be watched for signs of emotional distress.

HOW CHILDREN AND ADOLESCENTS REACT TO TRAUMA

Reactions to trauma may appear immediately after the traumatic event or days and even weeks later. Loss of trust in adults and fear of the event occurring again are responses seen in many children and adolescents who have been exposed to traumatic events. Other reactions vary according to age (Marans & Adelman 1997; Osofsky 1995; Pynoos et al. 1996; Vogel & Vernberg 1993):

For children 5 years of age and younger, typical reactions can include a fear of being separated from the parent, crying, whimpering, screaming, immobility and/or aimless motion, trembling, frightened facial expressions, and excessive clinging. Parents may also notice children returning to behaviors exhibited at earlier ages (these are called regressive behaviors), such as thumb-sucking, bedwetting, and fear of darkness. Children in this age bracket tend to be strongly affected by the parents' reactions to the traumatic event.

Children 6–11 years old may show extreme withdrawal, disruptive behavior, and/or inability to pay attention. Regressive behaviors, nightmares, sleep problems, irrational fears, irritability, refusal to attend school, outbursts of anger, and fighting are also common in traumatized children of this age. Also, the child may complain of stomachaches or other bodily symptoms that have no medical basis. Schoolwork often suffers. Depression, anxiety, feelings of guilt, and emotional numbing or "flatness" are often present as well.

Adolescents 12–17 years old may exhibit responses similar to those of adults, including flashbacks, nightmares, emotional numbing, avoidance of any reminders of the traumatic event, depression, substance abuse, problems with peers, and antisocial behavior. Also common are withdrawal and isolation, physical complaints, suicidal thoughts, school avoidance, academic decline, sleep disturbances, and confusion. The adolescent may feel extreme guilt over his or her failure to prevent injury or loss of life and may harbor revenge fantasies that interfere with recovery from the trauma.

Some youngsters are more vulnerable to trauma than others, for reasons scientists do not fully understand. It has been shown that the impact of a traumatic event is likely to be greatest in the child or adolescent who previously has been the victim of child abuse or some other form of trauma or who already had a mental health problem (Boney-McCoy & Finkelhor 1995; Duncan et al. 1996; Garbarino et al. 1991; Roth et al. 1997). And the youngster who lacks family support is more at risk for a poor recovery (Morrison 2000).

HELPING THE CHILD OR ADOLESCENT TRAUMA SURVIVOR

Early intervention to help children and adolescents who have suffered trauma from violence or a disaster is critical. Parents, teachers, and mental health professionals can do a great deal to help these youngsters recover.

After violence or a disaster occurs, the family is the first-line resource for helping. Among the things that parents and other caring adults can do are:

- Explain the episode of violence or disaster as well as you are able.
- Encourage the children to express their feelings and listen without passing judgment. Help younger children learn to use words that express their feelings. However, do not force discussion of the traumatic event.
- Let children and adolescents know that it is normal to feel upset after something bad happens.
- Allow time for the youngsters to experience and talk about their feelings. At home, however, a gradual return to routine can be reassuring to the child.
- If your children are fearful, reassure them that you love them and will take care of them. Stay together as a family as much as possible.
- If behavior at bedtime is a problem, give the child extra time and reassurance. Let him or her sleep with a light on or in your room for a limited time if necessary.
- Reassure children and adolescents that the traumatic event was not their fault.
- Do not criticize regressive behavior or shame the child with words like "babyish."
- Allow children to cry or be sad. Do not expect them to be brave or tough.
- Encourage children and adolescents to feel in control. Let them make some decisions about meals, what to wear, etc.
- Take care of yourself so you can take care of the children.

Most children and adolescents, if given support such as that described above, will recover almost completely from the fear and anxiety caused by a traumatic experience within a few weeks. However, some children and adolescents will need

more help perhaps over a longer period of time to heal. Grief over the loss of a loved one, teacher, friend, or pet may take months to resolve and may be reawakened by reminders such as media reports or the anniversary of the death.

In the immediate aftermath of a traumatic event and the weeks following, it is important to identify the youngsters who are in need of more intensive support and therapy because of profound grief or some other extreme emotion. Children and adolescents who may require the help of a mental health professional include those who show *avoidance behavior,* such as resisting or refusing to go places that remind them of the place where the traumatic event occurred, and *emotional numbing,* a diminished emotional response or lack of feeling toward the event. Youngsters who have more common reactions, including *re-experiencing* the trauma, or reliving it in the form of nightmares and disturbing recollections during the day, and *hyperarousal,* including sleep disturbances and a tendency to be easily startled, may respond well to supportive reassurance from parents and teachers.

WHAT ARE SCIENTISTS LEARNING ABOUT TRAUMA IN CHILDREN AND ADOLESCENTS?

NIMH, a part of the National Institutes of Health, supports research on the brain and a wide range of mental disorders, including PTSD and related conditions. The Department of Veterans Affairs also conducts research in this area with adults and their family members.

Recent research findings include:

- Some studies show that counseling children very soon after a catastrophic event may reduce some of the symptoms of PTSD. A study of trauma/grief-focused psychotherapy among early adolescents exposed to an earthquake found that brief psychotherapy was effective in alleviating PTSD symptoms and preventing the worsening of co-occurring depression (Goenjian et al. 1997).
- Parents' responses to a violent event or disaster strongly influence their children's ability to recover. This is particularly true for mothers of young children. If the mother is depressed or highly anxious, she may need to get emotional support or counseling to be able to help her child (Bromet et al. 2000; Deblinger et al. 1999; McFarlane 1987).
- Either being exposed to violence within the home for an extended period of time or exposure to a one-time event, like an attack by a dog, can cause PTSD in a child.
- Research has demonstrated that PTSD after exposure to a variety of traumatic events (family violence, child abuse, disasters, and community violence) is often accompanied by depression (Ackerman et al. 1998; Lipschitz et al. 1999; March et al. 1997; McCloskey & Walker 2000; Pfefferbaum et al. 1999). Depression must be treated along with PTSD, and early treatment is best.

NIMH-supported scientists are continuing to conduct research into the impact of violence and disaster on children and adolescents. Through research, NIMH hopes to gain knowledge to lessen the suffering that violence and disasters impose on children and adolescents and their families.

The General Public can obtain publications about PTSD and other anxiety disorders by calling NIMH's toll-free information service, 1-888-ANXIETY, or calling the Institute's public inquiries office at 301-443-4513. Information is also available online from NIMH's Web site (http://www.nimh.nih.gov/healthinformation/anxietymenu.cfm). The accompanying resource list indicates agencies or organizations that may have additional information about helping children and adolescents cope with violence and disasters.

Reporters interested in PTSD and other anxiety disorders may contact the NIMH press office at 301-443-4536.

Based on the NIMH booklet "Helping Children and Adolescents Cope With Violence and Disasters"—http://www.nimh.nih.gov/publicat/violence.cfm.

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