
**U.S. SECURITY AND THE RISK POSED BY
INFECTIOUS DISEASES**

While the average American life expectancy is substantially higher than it was in the past (and continues to grow) and many infectious diseases have been eliminated from the continent over the past century, microorganisms still pose a significant and increasing threat to the country. According to the National Intelligence Council (NIC), “New and reemerging infectious diseases will . . . complicate US and global security over the next 20 years. These diseases will endanger US citizens at home and abroad, threaten armed forces deployed overseas, and exacerbate social and political instability in key countries and regions in which the United States has significant interests.”¹ In recognizing the increasing threat posed by infectious disease, the NIC marked a watershed in U.S. foreign policy, particularly in the context of expanding its focus beyond traditional, state-centered sources of instability.

Why are emerging and reemerging infectious diseases on the rise? Many of the factors discussed in Chapter Two regarding the general increased microbial threat apply equally to developing countries and to the United States, including globalization, modern medical practices, accelerating urbanization, global warming, and changing social and behavioral patterns. (Some apply to the United States to a greater extent than others.) This chapter analyzes these various influences in greater detail and delineates the impact that infectious

¹NIC, “The Global Infectious Disease Threat and Its Implications for the United States,” p. 5.

disease is currently having on the United States, individually, socially, politically, financially, and strategically.

IMPACT AND SPREAD OF DISEASE IN THE UNITED STATES

Gauging the true impact of infectious disease on the United States is problematic for several reasons. First, the current burden of most infectious illnesses is very low compared with what it might have been had vaccines and other preventative treatments not been used for decades. Second (and related to this), is the fact that the prevalence of pathogenic organisms is liable to increase dramatically in the absence of effective control measures. Third, because of the multiplier effect, every case of disease that is successfully mitigated now reduces future incidence by more than one. Finally, significant intangible costs and effects often surround disease spread and containment, such as social stigmatization, loss of worker productivity, apprehension, grief, and pain.

This being said, there are certain indices that can be used to provide a rough illustration of how infectious ailments are presently serving to affect the United States. In terms of human lives, pathogenic organisms claim approximately 170,000 people annually, which is nearly double the historic low in 1980. Some of the most pervasive killers currently include AIDS, influenza, and foodborne illnesses. Combined, these conditions kill approximately 56,000 people every year (17,000, 30,000, and 9,000, respectively).² Certain deaths that have not traditionally been regarded as infectious disease-related, including heart disease and cancer, have also been reclassified as such.³

New and existing diseases cross American borders in ever increasing numbers. HIV, West Nile virus, Lyme disease, Legionnaires' disease, hantavirus pulmonary syndrome, and nearly 30 other diseases were first recognized in the latter half of the 20th century in the United

²NIC, p. 6.

³NIC, p. 10. For instance, nearly four million Americans are infected with the hepatitis C virus, which can cause liver cancer and cirrhosis. The death toll may surpass that of AIDS by 2005. Also, the role of human papilloma virus in cancer of the female organs is increasingly being recognized.

States. Multidrug-resistant TB, antibiotic-resistant *Streptococcus pneumoniae* (the bacteria that cause ear infections), pneumonia, meningitis, rabies, and diarrheal disease caused by *Cryptosporidium parvum* and by *E. coli* OH157 all also surged at the end of the 1900s. Underscoring all this is the increased threat of bioterrorism, which has the potential to claim a significant number of lives in a short period of time.

In addition to taking human lives, outbreaks and epidemics cause a considerable amount of chaos and can have a large economic toll. The CDC estimates that the total direct and indirect cost of infectious disease is approximately \$120 billion per year.⁴ The lifetime, discounted, direct medical outlay of treating a person with HIV alone is thought to be \$96,000,⁵ while total costs for Lyme disease, if not identified early, can range from \$2,228 to \$6,724 per patient per year.⁶

The toll wrought by animal infectious disease outbreaks can be just as significant. The U.S. Department of Agriculture (USDA) has estimated that if a hoof-and-mouth disease outbreak occurred in the United States, it could cost the livestock industry \$20 billion over 15 years because of increased prices for consumers, reduced agricultural productivity, and restricted trade.⁷

FACTORS AFFECTING THE SCOPE AND SPREAD OF INFECTIOUS DISEASE IN THE UNITED STATES

Despite the costs described above, the impact of disease on America is still manageable. However, this could change rapidly as Americans are exposed daily to growing numbers of new, more virulent, and even common organisms. The reasons are complex and diverse but generally include increased travel and trade, changes in agricultural practice, more promiscuous drug and sex patterns, greater use of

⁴NIC, p. 54.

⁵Direct medical costs include physician and clinical staff charges, medications, devices and appliances, and diagnostic tests.

⁶CDC, "Economic Costs for Patient Care from Infectious Diseases, United States," available at <http://www.cdc.gov/ncidod/emergplan/box02.htm>.

⁷As cited in NIC, p. 58.

antibiotics, use and donation of blood products, climatic change, tainted water supplies, and the increased risk of bioterrorism.

Globalization—Travel, Migration, and Trade

Americans are at increased risk of contracting exotic illnesses from both travel abroad and contact with visitors to the United States. Almost 60 million citizens traveled internationally in 1998. With less than 36 hours of travel time between most parts of the world, many diseases may incubate and emerge only once a person has returned home. In addition, approximately one million immigrants and refugees enter the United States each year, many of whom come from countries burdened by infectious illness.⁸ Immigrants entering America for extended stays must undergo medical screening; however, such requirements obviously do not apply to those who enter illegally.⁹ Rises in the number of diseases such as TB and malaria have been directly related to these “irregular” foreigners. In 1999, for example, of the more than 150,000 illegal immigrants who were caught and then examined for infections by the U.S. Public Health Service, 126 people were diagnosed with TB. This number is 25 times the number that would be expected if Americans born in the United States were examined and more than four times the numbers that would be expected of the country’s foreign-born population.¹⁰ Exacerbating the situation is the fact that many immigrants, both legal and illegal, do not have adequate access to healthcare once they arrive in the United States.¹¹

⁸NIC, p. 56.

⁹In the 1990s, it is estimated that three to four million undocumented aliens entered the United States. J. S. Passel and M. Fix, “US Immigration at the Beginning of the 21st Century,” testimony before the Subcommittee on Immigration and Claims, U.S. House of Representatives, August 2, 2001, available at www.urban.org/TESTIMON/passel_fix_08-02-01.html, accessed November 9, 2001.

¹⁰Nick Chiles, “Major Screening for TB Shows Contrast in Conditions Since Days of Ellis Island,” *New York Times* online, January 11, 2000, available at http://www.nytimes.com/learning/teachers/featured_articles/20000111tuesday.html, accessed December 15, 2001.

¹¹M. Lillie-Blanton and J. Hudman, “Untangling the Web: Race/Ethnicity, Immigration, and the Nation’s Health,” *American Journal of Public Health*, Vol. 91, No. 11, November 2001, p. 1736.

While laws and border regulations attempt to provide a level of external security from diseases, because of the number of people and goods that enter the United States each year, the likelihood of intercepting an infected person, animal, or plant is very small. The effectiveness of this system of border protection is also open to question. According to the Committee on International Science, Engineering, and Technology (CISET), only about 1 percent of goods entering the country are screened at their point of disembarkation, and notification requirements as described by the Public Health Service Act and Foreign Quarantine Regulations do not cover people who are not obviously ill, animals or insect vectors carrying disease, or those arriving by automobile. The ability of the CDC surveillance regime to identify unfamiliar illnesses entering the country is also debatable, not least because inspectors staff only seven ports of entry.¹² In reality, U.S. defense relies on surveillance at the local rather than federal level. As described in Chapter Five, however, the local public health infrastructure has been neglected over the past quarter century.

Increased animal and food trade has also affected the microbial threat to the United States. The Food Safety and Inspection Service (FSIS) screens food products for an array of zoonotic diseases, including rabies, TB, and brucellosis. However, only a small number of samples are tested and new diseases may not be immediately recognized, potentially exposing humans and animals to deadly infections. Equally, while the USDA's Animal and Plant Health Inspection Service (APHIS) attempts to protect U.S. livestock by excluding and eliminating disease-causing foreign animals, a lack of resources has affected the ability to carry out comprehensive inspections. Indeed, even when contaminated products are detected, the USDA, the Food and Drug Administration (FDA), and other federal agencies have little enforcement power.¹³

¹²The seven ports are the airports in New York, Miami, Chicago, Seattle, San Francisco, Los Angeles, and Honolulu. At other ports, airline workers, CDC-contract physicians and Immigration and Naturalization Service officials fill this function. As a result of the paucity of inspections, the CDC invoked its power to detain people at U.S. ports of entry only three times from 1982 to 1992. C. H. Foreman, Jr., *Plagues, Products, and Politics: Emergent Public Health Hazards and National Policymaking*, Washington, D.C.: Brookings Institution Press, 1994, p. 62.

¹³The USDA regulates red meat, poultry, and certain egg products under the Federal Meat Inspection Act and the Poultry Products Inspection Act, while the FDA controls the safety of all other foods under the Federal Food, Drug, and Cosmetic Act (FFDCA).

Increases in trade and shipment of food products, both domestic and foreign, constantly expose individuals to a variety of diseases. According to the NIC, “The globalization of the food supply means that nonhygienic food production, preparation, and handling practices in originating countries can introduce pathogens endangering foreign as well as local populations.”¹⁴ In the United States, it is estimated that 76 million people suffer from some sort of foodborne illness each year. Nine of the most serious ailments are listed in Table 4.1.

Table 4.1
Laboratory-Confirmed Cases of Nine Foodborne Diseases Under Surveillance in the United States, 2000

Disease	Cases
Salmonellosis	4,640
Campylobacteriosis	4,237
Shigellosis	2,324
<i>E. Coli</i> 0157 infection	631
Cryptosporidiosis	484
Yersiniosis	131
Listeriosis	101
<i>Vibrio</i> infections	61
<i>Cyclospora</i> infections	22

SOURCE: “Preliminary FoodNet Data on the Incidence of Foodborne Illnesses—Selected Sites, United States, 2000,” *MMWR Weekly*, Vol. 50, No. 13, April 6, 2001, pp. 241–246, available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5013a1.htm>, accessed June 21, 2002.

Under the FFDCA, the FDA inspects these products to detect and forbid adulterated or misbranded foods and other products from crossing state borders. The FDA can use limited administrative enforcement tools such as voluntary recalls when violations are found; however, the FDA must rely on the Justice Department to initiate harsher actions such as injunctions, seizures, or prosecutions. *The FDA does not have the power to mandate recalls.* FSIS inspectors, who inspect meat and poultry, also *do not have mandatory recall authority*, and inspectors must go through a federal district court to direct a U.S. marshal to seize product. See Donna U. Vogt, “CRS Issue Brief for Congress: Food Safety Issues in the 106th Congress,” February 12, 1999, available at <http://www.csa.com/hottopics/ern/99jul/ag-38.html>, accessed December 15, 2001.

¹⁴NIC, p. 22.

Changes in Agricultural Practice

Modern agricultural practices in the United States have also increased the risks from the food supply. Advances in technology—such as antibiotics, automatic feeding, and automatic milking—allow farmers to breed animals in close proximity to one another, which provides a perfect setting for the transmission of viral and bacterial agents. Moreover, the rapidity with which animals are shipped across the country makes it difficult to track the geographic spread of infections. From a public health perspective, this becomes especially problematic in the case of zoonotic diseases. Given the relative ease of transformation from animal to deadly human virus, it would not be difficult for infections of this type to spread among the U.S. populace where large numbers of immunocompromised animals are shipped cross-country daily.¹⁵

Behavioral Changes

In the United States, as elsewhere in the world, more permissive sexual behavior and prolific intravenous drug use have opened up new pathways for human-to-human microbial transmission. Many STDs have seen a meteoric rise in the United States since the 1960s due to the sexual revolution, with HIV/AIDS being perhaps the deadliest example of the dangers of these types of behaviors.¹⁶ During the first 20 years of the American HIV/AIDS epidemic, for example, 774,467 persons were reported with AIDS, more than half of whom subsequently died.¹⁷

¹⁵Recently, scientists at the University of Wisconsin came to understand that there are relatively few genetic steps between the chicken influenza and the human pathogen, raising fears of another outbreak similar to the one in Hong Kong. According to John Oxford, a flu expert and professor of virology at St. Bartholomew's and the Royal London Hospital, "rather small changes in vital places can make the difference between life and death," as quoted in G. Kolata, "Clues to Deadly Virus Changes Seen," *San Jose Mercury News*, September 7, 2001, available at www.mercurycenter.com/cgi-bin/edtoolssss/printpage/printpage_ba.cgi, accessed September 7, 2001.

¹⁶Mitchell Cohen, "Changing Patterns of Infectious Disease," *Nature*, Vol. 406, 2000, pp. 762–767.

¹⁷"HIV and AIDS—United States, 1981—2000," *MMWR*, Vol. 50, No. 21, June 1, 2001, pp. 430–434.

Although HIV/AIDS first spread through the relatively open American homosexual community, it is now most often spread among intravenous drug users. According to the CDC, half of all new infections currently result from the sharing of needles to inject heroin and cocaine.¹⁸

The threat of HIV/AIDS in the United States may also be increasing due to complacency brought on by the success of ARTs. This is especially true among MSMs and in minority populations as indicated by studies of STDs and sexual behaviors.¹⁹ As mentioned elsewhere in Chapter Three, persons infected with HIV/AIDS are at greater risk of contracting and succumbing to many other opportunistic infections that are on the rise, such as TB.²⁰ The prevalence of drug-resistant microorganisms, discussed below, further complicates treatment of those living with compromised immune systems.

Advances in technology have also influenced behavioral patterns by changing the way Americans live. This has relevance for disease as it brings individuals into contact with a whole new subset of micro-

¹⁸See CDC—National Center for HIV, STD, and TB Prevention—Division of HIV/AIDS Prevention, “HIV/AIDS Surveillance Supplemental Reports,” available at <http://www.cdc.gov/hiv/stats/hasrsupp51.htm>. See also S. D. Holmberg, “The Estimated Prevalence and Incidence of HIV in 96 Large US Metropolitan Areas,” *American Journal of Public Health*, Vol. 86, No. 5, 1996, pp. 642–654. It should be noted that many commentators reject the idea that it is possible to “map” the number and pattern of new HIV infections. See, for instance, the Committee on HIV Prevention Strategies in the United States, *No Time to Lose: Getting More From HIV Prevention*, Washington D.C.: The Institute of Medicine, 2001.

¹⁹From 1998 through 2000 a study Phase II of the Young Men’s Study was performed and sampled male-to-male sex with partners of ages 23 to 29 in six U.S. cities. Preliminary data showed that 13 percent of 3,000 men were HIV-positive, with prevalence rates of 7 percent among whites, 14 percent among Hispanics, and 32 percent among blacks. In a recent study of young men, high HIV incidence was associated with having more than five male sex partners during the preceding six months, having unprotected anal sex with men, or having injected drugs. “HIV Incidence Among Young Men Who Have Sex With Men—Seven US Cities, 1994–2000,” *MMWR*, Vol. 50, No. 21, 2001, pp. 440–444.

²⁰In addition to HIV/AIDS, improvements in healthcare and disease treatment have led to a significant increase in the number of immunocompromised people in the United States. The growing elderly population, patients undergoing chemotherapy, and those taking immunosuppressive drugs (such as transplant patients) are all at increased risk for contracting and succumbing to infectious diseases. These individuals also put the greater population at risk because they can become carriers of many illnesses.

organisms. For instance, water towers used for climatic control provide highly suitable breeding grounds for *L. pneumophila*.²¹ Equally, while the use of refrigeration to extend the life of foods has reduced exposure to many bacteria, it also led to the rise of organisms, such as *Listeria monocytogenes*, that thrive in colder environments. (*L. monocytogenes* causes nearly 2,000 illnesses and more than 400 deaths per year in the United States.) It is often difficult to predict how technological advances and associated behavioral changes will affect the balance between humans and microorganisms.

Misuse of Antibiotics and Other Medicines

Overuse of antibiotics and other drugs in the United States to “treat” viruses together with failure to finish prescriptions and the use of antibiotics in animals have dramatically hurt the effectiveness of these medications and led to the rapid rise of highly resistant “supergerms.”²² According to the CDC, nearly all bacteria of concern have developed some degree of resistance in part because of the fact that up to 50 million prescriptions a year are written for antibiotics unnecessarily.²³ For instance, according to the National Institute of Allergy and Infectious Diseases (NIAID), drug resistance is a factor in the threat posed by TB, gonorrhoea, malaria, and pneumococcal diseases. Treating these hardy microbes has a high cost as well, perhaps

²¹This was first recognized in 1976 when pneumonia struck 221 people at an American Legion convention in Philadelphia.

²²For a full discussion of antibiotic resistance, see S. B. Levy, *The Antibiotic Paradox: How the Misuse of Antibiotics Destroys Their Curative Powers*, 2nd edition, Cambridge, Mass.: Perseus Publishing, 2002; Laurie Garrett, *The Coming Plague: Newly Emerging Diseases in a World out of Balance*, New York: Penguin Books, 1994; WHO, *Overcoming Antimicrobial Resistance*, 2000, available at www.who.int/infectious-disease-report/; Stuart B. Levy, “The Challenge of Antibiotic Resistance,” *Scientific American*, Vol. 278, No. 3, March 1998, pp. 46–53; and B. Schwartz, D. Bell, J. M. Hughes, “Preventing the Emergence of Antimicrobial Resistance: A Call for Action by Clinicians, Public Health Officials, and Patients,” *JAMA*, Vol. 278, No. 11, September 17, 1997, pp. 901–904.

²³CDC, “Antibiotic Resistance,” available at <http://www.cdc.gov/antibiotic-resistance/>, accessed June 21, 2002, and CNN, “Antibiotic Resistance a Growing Threat,” June 12, 2000, available at <http://www.cnn.com/2000/health/06/12/antibiotic.resistance>, accessed June 21, 2002, report improper drug use to blame for the growing resistance.

as much as \$30 billion per year in the United States.²⁴ Hardly any new antibiotics have been developed, with only one additional antibiotic class introduced in the country during the past 15 years.²⁵

In the United States, antibiotic-resistant, nosocomial (hospital-acquired) infections caused by resistant *S. aureus* currently kill approximately 14,000 patients annually.²⁶ Generally up to 70 percent of hospital-acquired infections are caused by drug-resistant microbes.

Overall the numbers of resistant organisms are rising. More than 50 percent of all TB cases in the United States are now “immune” to at least one drug, and 32 percent were resistant to two or more of the premier anti-TB drugs in 1994, up from 10 percent in 1984.²⁷

Donated Blood Products

Another aspect of U.S. medical practice that can potentially spread dangerous diseases is the use of donated blood products. The nation’s blood supply, while strictly regulated and screened, can be protected only from readily identified pathogens. Essentially this means that diseases like HIV, hepatitis C, and variant Creutzfeldt-Jakob, which have long incubation periods, could be spread through the blood supply before they become immediately apparent.

²⁴NIAID, “Antimicrobial Resistance,” fact sheet, available at <http://www.niaid.nih.gov/factsheets/antimicro.htm>, accessed January 16, 2002.

²⁵Overuse and misuse of fungal and viral treatments contribute to the dangers of microbes as well. Aventis Pharmaceuticals, Inc., introduced SYNERCID and Pharmacia & Upjohn introduced Zyvox in 2000 to treat gram-positive infections such as pneumonia and bacteremia (CNN, “FDA Approves First in a Long-Awaited New Class of Antibiotics,” April 18, 2000, available at www.cnn.co/2000/HEALTH/04/18/new.antibiotic, accessed December 7, 2000).

²⁶In excess of 80 percent of *S. aureus* isolates in the United States are penicillin resistant and 32 percent are methicillin resistant (NIC, p. 6). More generally, it is estimated that nosocomial infections contributed to nearly 90,000 deaths in 1995 and cost \$4.5 billion. See Robert Weinstein, “Nosocomial Infection Update,” *Emerging Infectious Diseases*, Vol. 4, No. 3, 1998, available at <http://www.cdc.gov/ncidod/eid/vol4no3/weinstein.htm>, accessed December 7, 2000.

²⁷NIC, p. 55. An additional factor that played a role in exacerbating the challenge in dealing with TB during the 1980s was the abandonment of the surveillance system for recognizing multidrug-resistant TB strains. This was reinstated in 1993, however, once it was recognized that cases of resistance TB were once again rising.

The latent dangers of covert pathogenic transmission are well illustrated by hepatitis C. Although Harvey Alter, a researcher at the National Institutes of Health (NIH), had first recognized in the 1970s that a new form of hepatitis was attacking livers of blood recipients, it was not until 1989 that Michael Houghton at Chiron Corporation identified the etiologic agent—hepatitis C virus. Consequently, for almost 20 years patients in the United States and elsewhere were at about a 30 percent risk of receiving blood contaminated by hepatitis C. This particular disease has proven especially problematic to fight because until recently researchers have been unable to grow it in the laboratory. Moreover, the causative viral agent mutates often, making it difficult for the human body to develop full immunity after exposure. Currently, nearly three million Americans are living with chronic hepatitis C infection, about 10 to 20 percent of whom may develop liver-destroying cirrhosis or cancer.²⁸ HIV also contaminated the blood supply prior to 1985 when screening was initiated; however, this has had a less devastating effect on the population, resulting in just over 1,000 AIDS cases at its peak in 1993.²⁹

Climatic Change

Climatic change has also provided a mechanism for escalating the exposure of individual Americans to new and more virulent pathogens. As noted in Chapter Two, increasing evidence suggests that disturbances in climate and weather patterns play a significant role in influencing the distribution media for infectious pathogenic agents.³⁰ In the short term, they can increase vector populations that spread disease to human hosts. For example, the New Mexico hantavirus pulmonary syndrome outbreak that emerged in 1993 occurred after an unusually wet spring in the Southwest, which allowed the deer mouse carrier population to swell dramatically; by 1995, the disease had spread to 21 U.S. states.³¹ In the long term, if climatic

²⁸Charlene Crabb, "Hard-Won Advances Spark Excitement About Hepatitis C," *Science*, Vol. 294, 2001, pp. 506–507.

²⁹"HIV and AIDS—1981–2000," *MMWR*, pp. 430–434.

³⁰Paul Epstein, "Climate and Health," *Science*, Vol. 285, 1999, pp. 347–348.

³¹Brian Hjelle, "Hantaviruses, with Emphasis on Four Corners Hantavirus," 1996, available at <http://www.bocklabs.wisc.edu/ed/hanta.html>, accessed November 16, 2001.

changes are significantly in concert with the introduction of new disease vectors from foreign countries, it is conceivable that infections such as malaria, cholera, and dengue could reestablish themselves in the United States as well as elsewhere.

Tainted Water Supplies

Most of the U.S. water supply is screened only for representative bacteria such as fecal coliforms. This leaves the population at risk from new or unusual pathogens that enter water systems undetected. Moreover, an aging infrastructure has significantly undermined the ability of authorities to ensure that known contaminants are properly removed.³²

The large and growing population of immunocompromised individuals in the United States increases the significance of water supply contamination. The cryptosporidiosis outbreak in April 1993 in Milwaukee is an example of how extensive the problem can be. In this instance, over 400,000 people became ill and approximately 100 died after the filtration system in the water treatment plant failed. It is certainly possible that another unannounced pathogen could similarly sicken and injure unsuspecting citizens.

Bioterrorism

The spate of anthrax mailings unleashed throughout the United States in fall 2001 transformed the threat of bioterrorism into a reality. Although the human impact (in terms of lost lives) of this manifestation of the disease threat remains tiny in comparison to that of naturally occurring infections, the economic and psychological toll is significant. The U.S. Postal Service alone estimates that the cost of responding to the anthrax attacks as well as new sterilization pro-

³²In February 2001, the Environmental Protection Agency estimated that nearly \$151 billion is required over the next 20 years to maintain, replace, and upgrade the water supply system to ensure safe drinking water, with a quarter of these funds dedicated to treatment (U.S. Senate, testimony of Tracy Mehan, Assistant Administrator for Water, U.S. Environmental Protection Agency, before the Committee on Environment and Public Works, Subcommittee on Fisheries, Wildlife, and Water, October 31, 2001, available at http://www.win-water.org/win_legislative/win_testimony/103101mehan.html, accessed November 30, 2001).

cedures for mail will be in the range of \$5 billion; this is from an attack in which only five deaths and 17 known infections occurred from a noncontagious disease.³³ The overall human and economic ramifications would be much greater with a contagious weapon.

Public health and medical experts, policymakers and others with genuine or economic motives have undoubtedly fueled the fear of bioterrorism in the United States.³⁴ However, alarming scientific and psychological changes are occurring, which may increase the overall risk of deliberately introduced diseases. For instance, scientists working to sterilize mice for the purpose of controlling the rodent population have created an extremely virulent mousepox with a technique that might be useful for creating an extremely potent smallpox weapon.³⁵ Further, in 1997, Russian scientists created a genetically engineered *Bacillus anthracis* (the microbe that causes anthrax) that could overcome protection given by the vaccine currently produced in the United States.³⁶

As this chapter shows, the threat of infectious diseases is omnipresent in the United States. This is problematic largely because, just as American citizens are coming into increased contact with emerging and reemerging pathogens, the country's ability to respond to microbial agents has been eroded in many areas. Chapter Five turns

³³WEVA, "US Post Office Acquires Irradiation Technology," October 28, 2001, available at <http://www.weva.com/cgi-bin/newsreader.pl?storyid=255&type=I>; Ray Schmid, "Post Office Turns to Congress for Financial Help," Associated Press, November 8, 2001, available at <http://sns.kcpq.com/sns-anthrax-mail.story>.

³⁴However, the large-scale use of these weapons by terrorists is unlikely in the near future, because of lack of both motive and technical capabilities. Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction, *First Annual Report to the President and the Congress—I: Assessing the Threat*, Santa Monica, Calif.: RAND, December 15, 1999; Bruce Hoffman, "Twenty-First Century Terrorism," foreword in James M. Smith and William C. Thomas, eds., *The Terrorism Threat and the U.S. Government Response: Operational and Organizational Factors*, Colorado Springs, Colo.: U.S. Air Force Institute for National Security Studies, 2001.

³⁵Ronald J. Jackson et al., "Expression of Mouse Interleukin-4 by a Recombinant Ectromelia Virus Suppresses Cytolytic Lymphocyte Responses and Overcomes Genetic Resistance to Mousepox," *Journal of Virology*, Vol. 75, No. 3, February 2001, pp. 1205–1210.

³⁶A. P. Pomerantsev et al., "Expression of Cereolysine AB Genes in *Bacillus Anthracis* Vaccine Strain Ensures Protection Against Experimental Hemolytic Anthrax Infection," *Vaccine*, Vol. 15, Nos. 17–18, December 1997, pp. 1846–1850.

to this issue, first examining the critical components of U.S. disease prevention and mitigation and then assessing the main gaps that are currently serving to undermine the effectiveness of this overall system.