Infectious Diseases:
An Emerging Bioterrorist Threat Facing America

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Spring 2004
PUBP 710.009

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27 April 2004

Abstract

In recent years, a number of infectious diseases have emerged and in some cases re-emerged posing a large health and safety risk affecting America. This spread of infectious disease, while still primarily caused by natural sources, has recently been disseminated to humans via intentional terrorists means such as in the case of anthrax being circulated through the U.S. postal system. Events such as the anthrax occurrence, coupled with the potential for future attempts to cause mass harm via the spread of infectious diseases, has placed diseases of this nature into a category of being an emerging bioterrorist threat facing America. Research is being conducted in the area of identifying the diseases that have the greatest potential for being engineered and used to carry out bioterrorist attacks. Additionally, studies are underway to determine this country's areas of weakness in dealing with attacks of this nature, in order to better prepare America's public health system to be ready to respond to this ever-increasing, bioterrorist threat.

Purpose

The purpose of this research paper is three-fold. First, I intend to give a definition of bioterrorism, secondly I will provide examples of infectious diseases, including those of a zoonotic nature that have a potential of being used in biological attacks. Finally, I will highlight some of the strategic steps being researched and recommended by organizations such as the National Institutes of Health (NIH), the Federation of American Scientists (FAS) and the Institute of Medicine (IOM) in preparing America for potential attacks of this kind.

Introduction and Background

Dr. Anthony Fauci, Director of the National Institute of Allergy and Infectious Diseases (NIAID) at the NIH, defines bioterrorism as "the use of microorganisms that cause human disease, or of toxins derived from them, to harm people or to elicit widespread fear or intimidation of society for political or ideological goals" (Fauci, 2002). This form of terrorism is " . . . best seen as a variant of the general problem of emerging infectious diseases, the only difference being that increased virulence or spread into a susceptible population is a deliberate act of man rather than a consequence of natural evolution" (ibid). Whether infectious diseases are thought to be spread as a result of natural sources or found to be the result of an intentional attack, enough evidence has surfaced indicating that infectious diseases pose a major bioterrorist threat to America and can elicit widespread panic and have a catastrophic, deadly affect if steps aren't taken to prepare for and respond to it.

Awareness of America's vulnerability to terrorist attacks was never more evident than in the wake of the events of September 11th. Through this new awareness, studies and reports have surfaced regarding the potential for future terrorist attacks executed in non-conventional ways. Dr. Jonathan B. Tucker, Director of Chemical & Biological Weapons Nonproliferation Program at the Monterey Institute of International Studies in Washington, DC has stated, "Although it is unlikely that a small terrorist group working on its own would have the technical and financial resources to carry out a major bioterrorist attack on

the scale of the September 11 event, a state-sponsor might provide the terrorists with the necessary know-how, seed cultures, and specialized dissemination equipment. He continues by saying, “Alternatively, a wealthy terrorist organization might be able to recruit scientists and engineers formerly employed by a state-level biowarfare program, such as that of Iraq, South Africa, or the former Soviet Union (Tucker, 2001).

Prior to September 11, 2001, recorded incidents of harmful agents used for the purpose of bioterrorism date back as far as the 6th Century B.C., when Assyrians were said to have poisoned the wells of their enemies with rye ergot. In September of 1984, an Indian religious cult, the Rajneeshee, used Salmonella typhimurium to contaminate salad bars of two counties in the state of Oregon, poisoning 750 people for the purpose of influencing the outcome of a local election. And in 1995, Iraqi authorities acknowledged their biological warfare program contained 100 botulinum toxin, 50 anthrax, and 16 aflatoxin bombs, 13 botulinum toxin, 10 anthrax, and 2 aflatoxin Scud missile warheads, and 122-mm rockets filled with anthrax, botulinum toxin, and aflatoxin (http://www.bio-ned.nl/BioterrorK.htm).

Present research on the potential agents of bioterrorism conducted by the NIH, that includes efforts by the Centers for Disease Control (CDC) the Food and Drug Administration (FDA) and the Office of Emergency Preparedness (OEP) have focused on basic research into the pathogens that are acknowledged to be genuine bioterrorism threats (Fauci, 2001). The CDC has compiled a list of these

'select agents', which has been separated into three categories, A, B and C, according to risk (www.bt.cdc.gov/Agent/Agentlist.asp).

Category A agents include anthrax, smallpox and tularemia, and are those that can easily be disseminated or transmitted person-to person; cause high mortality, with potential for major public health impact; might cause public panic and social disruption and require special action for public health preparedness.

Category B agents include the ricin toxin, staphylococcus and Q fever and are those that are moderately easy to disseminate; cause moderate morbidity and low mortality; and require specific enhancements of the CDC's diagnostic capacity and enhanced disease surveillance.

Category C agents, including yellow fever and tuberculosis, consists of emerging pathogens that could be engineered for mass dissemination in the future because of their availability, ease of production and dissemination and potential for high morbidity and mortality (ibid).

Dr. Gary Weaver, of the Center for Food and Nutrition Policy at Virginia Tech, classifies these infectious diseases into categories of bioweapons in the following manner (Weaver, 2004):

1. Tactical
    a. Tularemia Bacteria
    b. Anthrax Bacterial Spores
    c. Venezuelan Equine Encephalitis
    d. Brucellosis Bacteria
    e. Others
2. Theater
    a. Ebola Virus
    b. Marburg Virus
    c. Others
3. Strategic
    a. Smallpox Virus

b. Plague Bacteria

When discussing infectious diseases as a bioterrorist threat, it is important to also mention that a large number of these infectious diseases are zoonotic. During his February 17, 2004 lecture, Dr. Gary Weaver defined zoonosis as being “an infection of infestation shared in nature by man and lower vertebrate animals.” Dr. Weaver stated, *“Several of the common diseases that affect animals and people (zoonoses) are animal diseases of great economic importance that have been weaponized in state-sponsored, biological warfare (BW) programs targeting people, animals, and or economies. These zoonoses threaten to devastate our national economy, public health, standard of living, and military preparedness.”*

This emergence and in some cases re-emergence of hazardous agents causing widespread human disease has brought up another serious dilemma. That dilemma being America’s capacity to recognize and respond to infectious diseases has greatly diminished in recent years for various reasons, including human demographics and behavior, technology and industry, economic development and land use, international travel and commerce, microbial adaptation and change, and breakdown of public health measures in changing patterns of infectious disease, opening the door to the potential for more bioterrorist attacks using unconventional weaponry. (IOM, Jan 92)

Dr. Allan Morrison of Inova Fairfax Hospital lists factors contributing to disease emergence to be changes in human demographics, advances in technology / industry, economic development / land use patterns, a dramatic

increase in international travel and commerce, microbial adaptation, and a breakdown of public health measures (Allan, 2004).

To help close in some of the gaps identified in the nation's ability to effectively respond to bioterrorist attacks, the CDC has put out a Public Health Preparedness and Response Capacity Inventory as a resource for state and local health departments in assessing their preparedness to respond to bioterrorism and outbreaks of infectious diseases (www.phppo.cdc.gov/od/inventory/index.asp). This is just one step in the direction of insuring the safety of our public health system. In addition to that, the Public Health Emergencies Act of 2001 provided money to each state to upgrade state and local health jurisdictions' preparedness for and response to bioterrorism. There are six focus areas for preparedness under this grant (www.dhhs.state.nh.us/DHHS/PHBIOTERRORISM/default.htm):

1. Preparedness Readiness and Planning Assessment
2. Surveillance and Epidemiology
3. Laboratory Capacity – Biologic and Chemical Agents
4. Health Alert Network & Communications Technology
5. Communicating Health Risks and Health Information
6. Education & Training

Studies released by organizations such as the NIH and the IOM, focus on strategies to defend against bioterrorism caused by the use of microbes, potential pathogens and other agents that result in infectious diseases. The IOM was contracted by the National Defense Authorization Act for Fiscal Year 2002 to study and provide a review and approval process for new medical countermeasures in order to identify new approaches to accelerate the process

and to identify methods for assuring that new countermeasures will be safe and effective (IOM, 2004). And included in the NIH FY 2003 outline of their plan for biodefense research the organization estimated that $1,747.9 million dollars of their funding would go towards constructing research facilities, conducting basic research on agents of bioterrorism, the discovery and development of drugs and vaccines, and additional clinical research.

Methodology

My interest in this the topic of infectious diseases posing a bioterrorist threat to America came from listening to a lecture given by Dr. Gary Weaver during my Spring 2004 semester as a student in PUBP 710.009. During his February 17th lecture titled "Special Issues in Bioterrorism: Emerging and Reemerging Zoonotic Diseases and Agro-Terrorism." Dr. Weaver explained the how animal diseases were being weaponized in biological warfare and discussed the impacts these diseases could have on our national economy, public health, standard of living and military preparedness (Weaver, 2004).

Dr. Allan Morrison held a related lecture on the topic of "Vaccine Development, Administration, International Agreements: Public Health Policy, Politics, and Commerce," the following Tuesday, February 24, 2004. Both speakers discussed infectious diseases in the context of bioterrorism and shared examples of some of the most prevalent ones.

In preparation for this paper, in addition to reviewing the information shared by Dr. Weaver and Dr. Morrison, I consulted research journals, book reviews, and the websites of the CDC, NIH, IOM, and organizations such as the Federation of American Scientists (FAS) to gain a better understanding of the definition of bioterrorism, types of infectious diseases and their potential as a bioterrorist threat, and the current research being conducted to produce strategies for dealing with this bioterrorist threat.

Results

Not all infectious diseases are viewed as having a high risk for becoming weaponized. Lyme Disease is one such disease that has been identified as posing little to no potential for biological threat. However, others as demonstrated in the past are recognized as having characteristics that make them potential agents of bioterrorism because of the relative ease in engineering them to be manipulated. These are the agents classified as category A by the CDC; anthrax, smallpox, and tularemia. Fortunately, organizations such as the NIH, IOM and FAS are currently researching ways to prepare for, defend against and respond to bioterrorism.

NIH

To defend against bioterrorism, according to Dr. Anthony Fauci, of the NIH, “preparation against civilians takes two major forms: 1.) intelligence and law enforcement activities to prevent attacks and 2.) public health activities to prepare for, respond to and lessen the impact of attacks. Dr. Fauci continues to assert “We are dealing with bioterrorism and not biowarfare, so there are really many agents that could be disruptive” (Fauci, 2001).

This agency plans to put a heavy focus on biologic agents that have a potential to become civilian bioterrorist agents including pathogens or toxins that can contaminate food and water supplies and certain zoonotic agents that can spread infection to humans from domestic animals (Fauci, 2002).

IOM

Events such as 9/11, the emergence of severe acute respiratory syndrome (SARS) and the realities of the ever worsening HIV/AIDs pandemic have the IOM exploring new strategies for meeting the challenge of preparing for future terrorist and bioterrorist attacks. In their 2002 report summary of a two-day workshop held by the Forum on Emerging Infections, they discuss the threat of bioterrorist attacks and their reminders of how vulnerable we are to these infectious agents. A statement from the report maintains that although they have been successful in taming former "microbial foes" with new anti-microbial agents and vaccines in the pipeline, and increasing drug resistance among infectious microbes, they "teeter on the brink of losing the upper hand in the ongoing struggle against these old and new foes" (IOM, 2003)

In regards to the research being conducted by the IOM under the National Defense Authorization Act contract, their research is currently still in progress, but in their final report issued in January of 2004, the Committee on Accelerating the Research, Development and Acquisition of Medical Countermeasures Against Biological Warfare agents released their current findings and recommendations. Among other things, contained in their report was the recommendation to Congress to authorize the creation of a new agency within the Office of the Secretary of the U.S. Department of Defense (DoD) to minimize redundancies and take advantage of new knowledge gained through efforts such as this. They also suggest that this new agency coordinate its activities with the National Institutes of Health.

FAS

The Federation of American Scientists maintains, “animal diseases raise arms control concerns through the potential use of animal pathogens in bio-terrorism and economic espionage” (Preslar, 2000). As an effective strategy for being pro-active and response-oriented they are pilot testing a surveillance system, called ILIAD-Tanzania, located in remote rural areas of developing or reorganizing countries for the purpose of disease detection, diagnosis, prevention and control. Through this program which is intended to be “a collaborative effort between veterinary service workers, local farmers, wildlife conservation personnel and local governments, the FAS hopes that over time, it’s success will result in controlling zoonotic diseases in human populations, and prevent disease epidemics in wild animal populations” (ibid).

Discussion

As Americans, although we have the strongest military force in the world, we are still vulnerable to acts of terrorism and bioterrorism as evidenced by the occurrences of September 11, the anthrax events and just recently the traces of ricin found in the mail on Capitol Hill. As our enemies increase and become more determined to carry out acts of terrorism, America, as a nation has to continuously anticipate these actions and take steps to be prepared to handle these attacks.

A strategy used in the sport boxing is that opponents study their opposition for areas of weakness. Once this information has been assessed, each boxer utilizes maneuvers, during the match, based on these weaknesses, with the intent of winning or being the last man standing. The way to avoid continuous takedowns or knockouts is to identify one's areas of weakness and work to strengthen them, while at the same time, always-focusing attention on the other boxer.

In his testimony at before the U.S. Senate Committee on Appropriations, Dr. Tucker discussed the key gaps and weaknesses in our current public health defenses. He highlighted four major areas of weakness in the U.S. public health system that would be adversely affected if a major epidemic were to happen today arising from either a natural emerging infection or an act of bioterrorism. Those four areas being:

1. Recognition and diagnosis by primary health care practitioners
2. Communication of surveillance information to public health authorities.

3. Epidemiological analysis of the raw surveillance data.

4. Delivery of the appropriate medical treatment and public health measures.

According to Dr. Anthony Fauci the " . . . preparation for and response to bioterrorism must be multifaceted and comprehensive, employing classic public health preparedness and activities at the federal and local levels" (Fauci, 2001). He also states that the role of the scientific community is no less important in diminishing the threat of bioterrorism because they have the knowledge base that will ultimately be "translated into effective tools in this comprehensive team effort."

Jonathan B. Tucker, made the following statement in regards to combating bioterrorism and natural emerging infections, before the Subcommittee of Labor, Health and Human Services Education, and Related Agencies of the U.S. Senate Committee on Appropriations:

> "Although experts disagree over the ease with which terrorists could acquire and use biological weapons, many studies have concluded that the threat of bioterrorism against the United States is growing, and that the nation is not adequately prepared to handle even a medium-sized biological attack. With a potential health emergency in the making, time is of the essence in reducing our vulnerability to this threat . . ." (Tucker, 2001).

The United States has shown leadership in the past by strengthening its own and other's capacities to deal with infectious diseases, but the present reality is we must do more to improve our ability to prevent, detect, and control emerging, as well as re-emerging, microbial threats to health (IOM, 2003).

Conclusion

Due to the increase in public awareness and security, it's no surprise that terrorists are resulting to more and more unconventional means of weaponry. Bioterrorism is one such means, especially since the spread of infectious diseases has a potential for causing widespread harm to humans through a means that we currently have little defense against. The past occurrences of Anthrax and ricin being circulated in the U.S. postal mail targeting Americans are only indicators of future risks involving the use of unconventional means to carry out terrorist acts.

Even if left alone, the potential for the spread of infectious diseases by natural occurrence has a potential for becoming a widespread problem. Add to that the "existence of a variety of possibilities for economic gain for perpetrators, increases the potential for attacks of a manmade nature since delivery systems are readily available and unsophisticated, maximum effect may only require a few cases, delivery from outside the target country is possible and an effective attack can appear natural." (Wheelis)

The spread of infectious diseases as a potential of bioterrorism is a true threat that must be taken seriously. Considering the fact that gaps have been identified in our current public health system to handle these types of attacks, it leaves America vulnerable and potentially incapable of providing an effective response to attacks of this nature, unless steps such as providing funding and guidance to states in the area of public health preparedness continue to be taken to immediately to close these gaps.

America right now is in the boxing ring, and the potential for a bioterrorist attack is currently a definite area of weakness for us. However, it is an area that many national agencies are already aware of and working at improving. These agencies include the NIH, FAS and IOM who are currently conducting research leading to strategies for improving our current inability to handle bioterrorist attacks and sounding the horn of awareness to others that changes must be made if we intend to remain standing “in the ring.”

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