

Emerging Health Security Threats and Impact of Bioterrorism on the U.S. National Security

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Abstract

Bioterrorism fear increases after the deliberate release of biological agents at the end of the twentieth century. Letters containing anthrax powder were posted through the U.S. postal system which produces fear among the population. The anthrax assaults after 9/11 made the nation conscious that the public health system is ill-prepared to administer a large-scale emergency. Bioterrorism issue is associated with the deliberate spreading of dangerous diseases thus how comprehensive bioterrorism prevention measures should be taken. Hence, the emergence of bioterrorism has enforced the US administration to transform its national security policy against nontraditional threats. The article shows how bioterror remains a credible threat and poses substantial challenges to the U.S. public health system. Additionally, analysis reveals how resilient public health infrastructure is dominant not only to shielding and enhancing the public's health security but also crucial for the nation's security.

Key Words: Biological Terrorism, Preparedness, Biosafety, Countermeasures, Public Health

Introduction

Terrorism poses significant security challenges in the 21st century. Biological terrorism means the spread of germs that can cause deadly diseases. The threat posed by deliberately released microorganisms and biological agents plays a crucial role. Fortunately, there have been no noteworthy losses recently due to bioterrorism. However, the anthrax attacks illustrate how the proliferation of biological weapons is a threat to international and national security. Since the attack with anthrax is a possible threat to society has come to attention after 9/11. Wherever biological weapons have been used in history, they spread fear and terror. Prior to September 2001, bioterrorism was analyzed as a low probability, high consequence incident (PILAT, 2000). In early September of 2001, the General Accounting Office (GAO) declared in a report on federal preparedness for a bioterrorism event that “the probability of a domestic bioterrorist attack has been considered to below and the possibility that terrorists may use chemical or biological materials may increase over the next decade” (Preparedness, 2002). In May 1998, Secretary of Defence William Cohen warned that “even contemplates using WMD against our forces, we will deliver a response that’s overwhelming and devastating” (TO, 2001).

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Overall, 22 persons infected as 5 died as of inhalational of anthrax and 17 were infected ([Jernigan et al., 2002](#)). The anthrax attacks traced a profound burden on American society. Moreover, after the anthrax outbreak more than 10,000 peoples received drugs and other medical therapy ([Bouzianas, 2009](#)). In total, these encounters cost billions of dollars. Such an attack could paralyze the country therefore U.S. government ratified legislation to strengthen a bioterrorism response system. There is need of interdisciplinary research collaboration as the “development of discovery techniques that are specialized to bioterrorism and security research sources” ([Barker, 2013](#)).

After terrorist attack, there have been long discussions on the U.S. preparedness against bioterrorism. The United States has scarcities in its bioterrorism preparedness strategies before anthrax mailings. Bioterrorism incident warned U.S. thus, U.S. established local, state, and federal government agencies in the response of bioterrorism. Numerous lessons were learned concerning the functions and tasks of federal, state, local, and nongovernmental agencies in responding to a large-scale disaster.

The assaults of 9/11 demonstrated the traditions U.S. domestic security was deficient and how the United States expected to be capable to react to calamities in the upcoming. Shielding against catastrophic threats is a main homeland security task filled with initiatives that have direct implications for bioterrorism defense. Therefore, in the history of bioterrorism prior to 9/11 followings initiatives were constructed to counter bioterrorism threats. Cooperation between States and international bodies remains essential in the face of terrorism worldwide.

Department of Health and Human Services (DHHS)

DHHS is the leading federal agency in managing public health against terrorist attacks and other emergencies (Preparedness, 2002). Prior to the 9/11 era, DHHS has enjoyed many tasks since becoming a separate organization, although its roots go back as much as the early days of U.S. history. However, in ancient times DHHS was only restricted to network of hospitals for the care of merchant seamen. Afterwards, DHHS responsibilities extended in the area of health, social insurance, education, issuance of license for polio vaccines, to monitor the purity of foods and the safety of medicines, establishment of communicable disease center, etc. These activities of DHHS lead to forerunner of several independent agencies such as the CDC and the OEP play the paramount role in preparation and response to bioterrorism outbreak. Whereas the Food and Drug Administration (FDA) also focused mainly on medical countermeasure ([Maher & Lushniak, 2009](#)). Bioterrorism Preparedness Act expands the responsibilities of the FDA in the matter of imports, exports and food processing. Since 2003, the FDA has had a mandatory registration system for transport of food at foreign and local level.

DHHS commenced its bioterrorism initiative in 1999. DHHS also asked the various states to enhance legal preparedness against the potential epidemics ([Wynia & Gostin, 2004](#)). The initiative has six strategic objectives: prevention of bioterrorism, infectious disease surveillance, medical and public health promptness for mass target incidents, the National Pharmaceutical Stockpile exploration and development of new drugs and vaccines, and information technology infrastructure. Financial support for these activities in the first 3 years (1999-2001) totaled \$730 million. CDC used mainly of those funds to launch the process of enhancing the bioterrorism preparedness and response aptitude of state and local health departments.

Centers for Disease Control and Prevention (CDC)

The CDC is a United States federal agency under the DHSS “to promote health and quality of life by preventing and controlling disease, injury, and disability” ([Sleet, Bonzo, & Branche, 1998](#)). Prior to the 9/11 era, the CDC was restricted to perform limited tasks. CDC’s efforts to control infectious diseases prior to the 9/11 era are summarized below:

- Originally created to deal with malaria management in 1946
- In 1951 the development of Epidemic Intelligence Service

- Contributed in worldwide immunization programs and smallpox eradication
- In late 1990s, approximately 800–1,000+ areas investigations
- New diseases eradication programs: Legionnaire's Disease, Lyme disease, toxic shock syndrome, West Nile, HIV etc.
- Initiated to fund cooperative agreements with every state, territory, and several large municipalities that focused on preparedness efforts in 1999
- Currently the CDC focus is on bioterrorism and emerging infectious diseases

Surveys and studies performed prior to the 9/11 era found that numerous agencies lacked sufficient laboratories or epidemiologists trained to detect infectious disease happened due to bioterrorism outbreaks.

CDC's Surveillance Systems

The term Surveillance was defined as the “ongoing, systematic collection, analysis, and interpretation of health-related data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those responsible for prevention and control” (Thacker, Qualters, Lee, Control, & Prevention, 2012). However, Till 1950, the term surveillance was narrow in public health. Bioterror attacks cannot be prevented by the system, which will link existing measuring instruments. However, it enables a faster response, such as vaccinations and surveillance. Historically, public health employs surveillance system in the 14th century in Republic of Venice. Moreover, the concept of surveillance systems has shifted by 1893 and the Michigan was the first state of the U.S. which involve surveillance systems for detection and reporting of infectious diseases, (Smith III, 2016). Previously, in 1901, the states required early notification and detection for smallpox, tuberculosis, and cholera. (Thacker & Stroup, 2013). Surveillance has gained importance after the terrorist attacks.

Office of Emergency Preparedness (OEP)

Emergency readiness planning tasks primarily vested in National Security Resources Board, established by the National Security Act of 1947 as an autonomous agency. Later on in 1968, emergency preparedness planning redesigned as OEP for harmonized emergency preparedness functions, chiefly in areas of civil defense, resource utilization and post-attack rehabilitation association and stability. Redesignated OEP supervises the National Disaster Medical System ((NDMS)

The NDMS was founded in 1984 as a part of DHHS to provide medical care and hospitalizations in the incident a disaster overwhelm local emergency services (Mellehovitch, 2004). It is a collaboration of four federal agencies state and local governments and the private sector (Maddox, 2001). The principal focus of the MMRS is to expand or improve existing emergency preparedness systems in metropolitan areas to cope effectively a large-scale public health emergency. At the hub of NDMS are the Disaster Medical Assistance Teams, regional teams of doctors, nurses, and other health professionals to develop response capabilities for instance early recognition of specific hazards, defense of the public from risky exposures, mass patient care and casualty management, and environmental safety.

Prior to the 9/11 era, NDMS was part of the DHHS, where it was headed by the OEP. After 9/11 launch of the Homeland Security Act 2001, NDMS was transferred to the Department of Homeland Security. An internal DHHS report in 2002 identified important gaps in the medical promptness of NDMS, including poor management initiatives, inadequate funding and deficiency of suitable doctrine and standards.

National Pharmaceutical Stockpile (NPS)

The NPS was established in 1999 by CDC and DHHS (Kortepeter, Pavlin, Gaydos, & Rowe, 2000). The function of NPS was to guarantee the accessibility of the antidotes, life-saving pharmaceuticals and other

medical provisions and equipment required to counteract the effects of nerve modalities, biological microbes and chemical agents. The NPS is intended to expand state and local resources during an attack or other tragedy (Noji, 2001). Funds allocated to the NPS are utilized to procure, store and rotate supplies, to support states and vicinities in establishing plans for deployment and for providing training and model exercises for state and local officials in the application and distribution of organized resources. After 9/11, NPS has been extended to engage much more than just drugs and became the SNP program administered mutually by DHS and DHHS.

U.S. Army Medical Research Institute of Infectious Diseases

The objective of USAMRIID is to conduct basic and applied research on biological threats. The USAMRIID is managed by the Department of Defense and serves as the country's main laboratory for exploration into the medical characteristics of biological warfare. Particularly, the USAMRIID aims to formulate vaccines for infectious diseases, other therapeutic modalities such as drugs, and tests to identify and recognize disease-causing microorganisms.

Laboratory Response Network

A profound public health system is an essential element of bioterrorism defense. Public health laboratories also provide a serious task in the detection and evaluation of bioterrorist events. Improved and extended laboratory capacity has been described as a significant need in improving the public health system's disaster response potentials. The Laboratory Response Network was established in 1999 in preparation for the U.S. retort to bioterrorism. The LRN comprises of public health laboratories those identify microorganisms. The LRN was not completely operational prior to 9/11 era and anthrax incidents initiated but, even so, it functioned comparatively well.

In the LRN for bioterrorism, laboratories are divided into one of four ranks according to their testing facilities and capacities. The CDC laboratory is rank D, the highest level in the network. Next are laboratories at levels B and C with the ability to analyze for certain biological agents, for example anthrax. Level A will be made of local clinical laboratories that accomplish rule-out investigating and refer isolates to higher rank laboratories. For each rank, the network illustrates laboratory tasks, and outlines how to contact the Public Health Laboratory, CDC and the FBI to report suspected agents. Regardless of these endeavors to enhanced manage and systematize lab resources, the post 9/11 era anthrax attacks exposed serious deficiency in the nation's lab capacity. While the outbreak of bioterrorism one of the utmost challenges was the blend of a surge of samples submitted and the deficiency of enough specialized staff and compulsory laboratory resources to examine the samples. Anthrax Attacks 2001

The hazard of an expulsion, of biological agents with the purpose of threatens a national inhabitants or influence an administration is usually referred to the same as bioterrorism. The anthrax assaults made the nation conscious that the public health system is ill-prepared to administer a large-scale emergency. Hence, the emergence of bioterrorism has enforced the US administration to transform national security. Biological attack poses an unusual challenge to the public health systems. So, strong public health is commanding not only to defending and enhancing the public's health security but also essential for the nation's security.

National Security Transformation

More than 10 years have passed from the time while the assaults of 2001, altered the world and redesigned America's visions on numerous features of existence, as well as national security. US national security is the aptitude of national institutions to avert antagonists from employing force to harm Americans or their national welfares and the assurance of Americans in this potential. The aim of national security is to guide, manage, and unite U.S. Nation's homeland security endeavors. Transformed national security offers a

universal structure through which U.S. entire Nation is supposed to center its endeavors on the consequent four aims:

- Stop and interrupt terrorist assaults
- Defend the US individuals, dangerous infrastructure as well as fundamental assets
- Take action as well as to improve beginning events that happen
- Carry on reinforcing the base to guarantee lasting triumph.

As the initial three aims assist to categorize US national endeavors, the final aim involves generating and changes US security doctrines, arrangements, organizations, and foundations. This contains concerning a wide-ranging advance to threat administration, constructing a tradition of awareness, establishing a wide-ranging Homeland Security administration System enhancing incident supervision also employing ground-breaking technology, and apparatus of national authority as well as control.

Following 2001, bioterrorism has challenged and transformed existing laws and official structures concerning matters of protection, including the movement of public and products, separation and quarantine, vaccination, the annexation of facilities, national versus state establishments, emergency certificating of healthcare professionals and more. Therefore, national biodefense strategy was initiated after 9/11 era to transform the present programs implemented by several. The Bush strategy highlighted tasks of brainpower collection, threat investigation, vital infrastructure practical prevention, protection, attribution, attack warning, medical countermeasures, response planning and refinement.

Biodefense strategy for the 21st Century presents a base for the changed of tragic health risks occurrence. The Public Health and Bioterrorism Response Act deals with the funds throughout the CDC to the states for biodefense preparation, raising laboratory and communications apparatus, purchasing medical materials, performing emergency reaction trainings, and developing epidemiologic surveillance. Biodefense strategy particular construction needs the participation of a large variety of Federal departments and agencies.

Foundation of Department of Homeland Security (DHS)

The anthrax attack before this incident the U.S. never experienced its whole history: a mass global terrorist act on its own land, taking the lives of thousands of Americans. The outrageous events that emerged left no one unaffected. Therefore the U.S. government acted quickly to ensure that no such act would happen again. To facilitate this, the government formed the DHS to endeavor and tackle the new and hazardous threat offered by terrorism. Prior to the development of the Department of Homeland Security, homeland security actions were broadening; almost 2,000 disconnect Congressional appropriations accounts and have almost 40 federal agencies. DHS has four important tasks so as to correspond to the four planned distribution in the department.

- Circumference and carrying Security Control the boundaries and stop terrorists and volatiles as of entering the nation state.
- Emergency Preparedness and Response - Work among state and local establishments to react speedily and successfully to emergencies.
- Chemical, Biological, Radiological, and Nuclear (CBRN) Countermeasures – Transport jointly the country's most excellent scientists to expand equipment's that identify CBRN weapons to superlative defend nation.
- Information and Infrastructure Protection and manufacture a solo every day depiction of hazards not in favor of the homeland.
- Primarily serious characteristics of the achievement of homeland security programs are the aptitude to employ the improvements made promising by DHS in usual occurrences. To assist the nation re-establish the public health infrastructure to react effectively to every terrorist assault, Department

of Homeland Security has passed several initiatives such as Bioterrorism Act of 2002, BioWatch program and National Biosurveillance Integration System, etc.

Bioterrorism Preparedness and Response Act of 2002

President Bush in June 2002 signed act of 2002, which approved bigger financial support, at the same time as presenting a host of innovative procedures to

- Develop public health capability
- Promote health professionals' capability to distinguish and pay attention of diseases grounds via bioterrorism
- Promptly improvement of innovative vaccines as well as further countermeasures
- Develop shields designed for water and foodstuff resources
- Follow and standardize the employ of hazardous pathogens inside the US

Homeland security financial support has presented in favor of the U-turn of the previous time of public health infrastructure corrosion ensuing in the materialization of a stronger, additional prepared public health system. Even though the increasing of the public health infrastructure has been the mainly triumphant feature of homeland security, its capability to sustain the recently reinforced infrastructure through making sure that recently supported agendas and programs are capable to protect the nation's health for the period of catastrophe at the same time as supporting healthy inhabitants during everyday life is public health's furthestmost dispute.

Bio Watch program

BioWatch program was product of DHS and has paid over \$200 million on this program. The aim of BioWatch program is improving the proficiencies of earliest and performs truthfully in lab investigations. The BioWatch Program was established in 2003 "to provide early warning, detection, or recognition of biological attack"(Valdivia-Granda, 2013). The BioWatch program has three fundamentals:

- Taking samples for revealing of biological representative
- Investigation sample
- Reaction and reaction for optimistic biological agent recognition

National Bio surveillance Integration System

A blossoming government-broad system managed and coordinated through DHS, The most important aim of NBIS is to accumulate, collect, and investigate a wide range of significant information and create such information accessible to administration stakeholders in a timely and reliable fashion. In collaboration with the Homeland Security, CDC has worked directly with DHS to guarantee that information from the human health constituent of biosurveillance is successfully shared with the broader response community to advance situational awareness and harmonized decision-making. Biosurveillance for human health comprises three functional elements, whose objectives are to:

- Detect unusual incidents;
- Authenticate or rule them out as potential hazards; and
- Direct the response if a threat is confirmed

Some time ago entirely equipped, NBIS will accumulate data as of DHS resources and supplementary from US government agencies inside a general platform and merge those data among environmental and intelligence data. Researcher as of DHS will work jointly with researcher on DHS and NBIS aspect as of further federal agencies to development this information and present situational awareness to the DHS Homeland Security Operations Center.

Main element of NBIS is software to facilitate enthusiastically investigates Internet designed for information or gossips of infection events; software analytically investigates more than 1 million sites every day. There are several proofs in an attempt to this software have recognized fresh occurrences clearly previously older systems have not same capability.

The DHS Science and Technology Directorate urbanized the NBIS system necessity and afterward shifted the program to the 'Directorate for Information Analysis and Infrastructure Protection' during December 2004 designed for accomplishment. The origins of NBIS appear to be a completely in 2003 learning of the capability of the United States to hurriedly identify bioterrorist attacks. Sequences of interagency gatherings conclude inside a report during December 2004 so as to stain the end of the necessities- fortitude development and the initiate of the accomplishment procedure. NBIS officials propose on behalf of NBIS to provide the same as the eyes and ears of the nation for display and notices that timely premature recognition of a disease outburst, whether intentional within basis; it is not intended to restore presented agencies' tasks for reaction, hazard evaluation, or forensic acknowledgment.

Transformation of CDC

After 9/11, CDC's accountability, by the side of the Department of Health and Human Services, is on the way to detect disease hazard and to prevent further spread of disease. Detection has grown significantly after the terrorist attacks and also influential act in the existence system. (Dato, Wagner, Allswede, Aryel, & Fapohunda, 2001). There are specific programs underway at CDC and in every state to make America harmless. Consequently deeply development one-time made increasing the nation's military protections in opposition to biological assaults, President Bush initiated his government to evaluate current system and discover most up-to-date and better systems to make safe America. The result of this consideration is to building of information systems that timely detect threats which are helpful and appropriate for public health for investigating hazards. The CDC's deliberate sketch designed for bioterrorism awareness and reaction consist of:

- Improved competence designed for recognition, judgments and management of disease epidemics
- Enhanced classification as well as detection of contributory pathogens, toxins, or chosen germs
- all revelations
- Make stronger public health reaction capabilities to manage and hold such disasters
- Information technology transportation to hurriedly convey information also facts and figures that required preparing in favor of respond to these events

Bio Sense

Project BioSense was started by the CDC to develop the United States capability to keep an eye on human health events. BioSense was originally developed in 2003 after the events of 9/11 and subsequent anthrax attacks is a CDC program to maintain improved before time recognition and attentiveness for probable bioterrorism assaults and additional actions of public health apprehension going on a national stage. While BioSense plan engages wider actions in the public health perspective and principally spotlights on surveillance employ of the BioSense function. The BioSense program is a ground-breaking biosurveillance planned to raise the nation's emergency readiness during the real time disease detection, observing, and health situational alertness. BioSense accumulate and collect clinical data from hospitals and convey reporting to the CDC. The first version was released in 2004 and it was internet-based software system for gathering, evaluating, and exploring data. The BioSense program look at pre-diagnostic indicators of disease among in the population while using syndromic surveillance (Emory & Light, 2005). The BioSense program's idea is to present an integrated portrait of the health of the nation and broadly examine the healthcare system of the United States.

National Electronic Disease Surveillance System (NEDSS)

The anthrax attacks exposed an enormously troubles for public health departments. Pre-available scientific understanding was inadequate concerning several multifarious issues for instance how promising to overcome anthrax illness subsequent to disclosure of the microbes or how to evaluate the hazard of an environment polluted with anthrax microbes, also critically sluggish down communication.

Surveillance systems is supposed to scrutinize a lot of data types as feasible, launch systems of exchanging this information on an on-going basis, and then investigate that information. The NEDSS is a safe online structure that permits healthcare professionals and government departments to correspond about disease patterns and harmonize national response to outbreaks. After 9/11, CDC and state and local health departments had accepted the significance of systems and of homogeneous principles to advance the effectiveness of public health surveillance and the appropriateness of actions to outbreaks of disease. Earlier, state health agencies established the majority case-information by mail and then go through the data into computer systems, occasionally weeks behind the cases of transferable disease had happened, as well as cases that required instant public health exploration or intercession. The CDC commands that hospitals, clinics and state health departments all implement NEDSS standards so that the rapidity, accuracy, standardization and feasibility of data about diseases are enhanced.

Transformation of Department of Health and Human Services

Events of 9/11 served as an ongoing reminder that bioterrorism is a hazard to US Nation as well as the world. The Congress responded vigorously toward bioterrorism. Jointly, the Administration and Congress offered important new financial support to reinforce medical and public health competences to protect populations from future attacks. Therefore, in post 9/11 era Department of Health and Human Services updated the strategic plan to incarcerate important lessons learned from the past. The modernized plan spotlights on subsequent planned, which accumulate on the whole structure on behalf of HHS:

- Overcoming Bioterrorism
- Improving State and Local Readiness for Bioterrorism and Public Health Emergencies and Threats
- Extending DHHS Readiness for Bioterrorism and supplementary Public Health Hazards and crisis
- Obtaining Novel information Pertinent to Bioterrorism and Other Public Health Threats and Emergencies
- Increasing, Attaining, and Organizing Priority Medical Countermeasures for CBRN Threats

DHHS through cooperation agreements CDC has begun a conscious process of extending the presentation measures for health preparedness and public health for instance Project BioShield and enlargement against medical measures.

Project Bio Shield Act of 2004

Project BioShield has significant responsibility to linking the DHHS, its mechanism, agencies, and supplementary national organizations collaborating to accelerate the research, development, production and availability of measures against medical advancing the government's readiness countering CBRN threat agents. The Project BioShield Act 2004 is an important part of a wider approach to protect America in opposition to the danger. Joseph Larsen and Gary Disbrow have described that BioShield, "provided \$5.6 billion over 10 years to develop, purchase, and stockpile medical countermeasures for use in a public health emergency" (Larsen & Disbrow, 2017). BioShield supplies DHHS with numerous innovative establishments to accelerate research for the improvement of medical against measures such as vaccines, antibiotics, antivirals, and antitoxins. NIH, under the leadership of the DHHS works to complete a research program to develop strength against measures of high quality medical.

Strategic National Stockpile (SNS)

The SNS is a national stockroom of chemical antidotes, antibiotics, life support medications, vaccines, antitoxins, medical/surgical items airway maintenance and supplies. The SNS program was originally called the National Pharmaceutical Stockpile (NPS) but after 9/11 it has been extended to involve much more than just drugs. The Strategic National Stockpile is managed in cooperation by Department of Health and Human Services and Department of Homeland Security. The SNS is planned for elastic response. In 2009, during the outbreak of swine-origin influenza A (pH1N1) virus U.S. Government distributed antiviral medications through SNG within a week (Dimitrov, Goll, Hupert, Pourbohloul, & Meyers, 2011). The aid lies within the prompt reaction 12- hour termed as Push Packages. Push Packages are supplies of pharmaceuticals, remedies, and medical modalities planned to recommend quick delivery of a wide range of belongings for distracted hazard in the early hours of an occurrence.

Conclusion

Anthrax attacks in the US have shown that society is not ready to attack biological weapons. There are the possibility of misuse of dangerous biological agents and toxins. Effective national response and emergency management policies will be needed against bioterrorist attacks at the local, state and federal level. Bioterrorist attack reveals an obvious limitation in the national security policy of the United States against nontraditional threats. Although, the U.S. employees various techniques including large-scale emergencies after vulnerable terrorist attacks. Therefore, U.S. biodefense program initiatives and public health infrastructure preparedness will reduce the risk of the future bioterrorist attack. Subsequent the 9/11 attacks the U.S. has stressed the former, screening national security as a concern war against terrorists abroad involving senior military and foreign policy initiatives. This approach has dominated politics for national internal security and greatly focusing on intelligence and investigation. No matter how much the United States focuses on the issues highlighted abroad, if the United States cannot build assets and sufficient training at the domestic level, it will not be competent to respond to and recover from a large-scale emergency. As security safeguard forecaster it is foreseeable that the United States be the goal of another terrorist attack, most projectors must be specified to ensure our national competence emergency response is vigorous and aggressive. Since 2001 the noteworthy development has been done to defend America, President Bush launched sectors and agencies to reassess their efforts to discover new and better ways to preventing America from bio-attacks. The outcome of this revaluation is Biodefense for the 21st century that provides a widespread skeleton for U.S. nation's biodefense based on past achievements, identifies tasks and everyday duties.

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