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INFECTIOUS DISEASE IN THE TWENTY-FIRST CENTURY: THE NEED FOR A COMPREHENSIVE STRATEGY

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those skilled in war can make themselves invincible
but cannot cause an enemy to be certainly vulnerable.
Therefore it is said that one may know how to win,
but cannot necessarily do so.

Sun Tzu[1]

As national leaders formulate strategies for the twenty-first century, they are confronted by the re-emergence of infectious disease as a threat to national security. Despite the dramatic advances in genetics and biotechnology that occurred over the course of this decade, humanity has seen the nature and scope of the infectious disease threat evolve in ways that were previously unimaginable.

The Gulf War nearly brought the use of infectious disease as a weapon of war into the modern age. Inspection activities by the United Nations Special Commission (UNSCOM) and the defection of a key Iraqi government official revealed that Iraq had developed and produced large quantities of biological agents, had filled bombs and missile warheads with anthrax, botulinum, and aflatoxin, and had forward deployed a number of these weapons for possible use against coalition forces and Israeli cities.[2] These revelations were subsequently overshadowed by allegations made by Dr. Ken Alibek, a former First Deputy Director of Biopreparat in the Soviet Union. Dr. Alibek has stated in a variety of forums that during his tenure at Biopreparat, he oversaw a secret Soviet biological weapons program that sought to develop antibiotic-resistant strains of

[1] Sun Tzu *The Art of War* trans Samuel B Griffith (New York Oxford University Press 1963) 85
[2] Javed Ali Leslie Rodriques and Michael Moodie *Jane s U S Chemical-Biological Defense Guidebook* (Alexandria Jane s Information Group 1997), 222

anthrax and other bacteria, and to genetically alter smallpox and other viruses to enhance their virulence and pathogenicity.[3]

Bio-terrorism also became a reality in the 1990s as the Aum Shinrikyo cult attempted on several occasions to use infectious agents in and around Tokyo, prior to its chemical attack in the Tokyo subways.[4] Bombings at the World Trade Center in New York and the Alfred P. Murrah Federal Building in Oklahoma City brought terrorism to American cities and raised the possibility of chemical or biological attack within the United States. A number of hoaxes, most notably the delivery of a package to the international headquarters of B'nai B'rith in Washington D.C. that purportedly contained anthrax, demonstrated vividly the difficulties associated with responding to this emerging threat.[5]

While national security officials sought to respond to the possibility of infectious disease being used as a weapon, the medical community and public health officials witnessed a resurgence of infectious diseases throughout the

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[3] Alibek's book "Biohazard" alleges that the Soviet Union genetically altered anthrax to develop a strain that is resistant to five kinds of antibiotics William J Broad and Judith Miller "Soviet Defector Says China Had Accident at a Germ Plant," *New York Times*, 5 April 1999, 3 Alibek testified to Congress in May of 1999 that Soviet scientists had worked on splicing genes from other pathogens into the smallpox virus to produce novel microbes that may be able to evade the smallpox vaccine David Brown, "Destruction of Smallpox Samples is Reassessed, Some suspect Virus Also Exists in Secret " *Washington Post*, 15 March 1999, A1

[4] A New York Times investigation revealed that Aum Shinrikyo carried out at least nine biological attacks during the early 1990s William J Broad, "How Japan Germ Terror Alerted World " *New York Times*, 26 May 1998, A1

[5] Sari Horwitz, "B'nai B'rith Package Contained Common Bacteria Involved Tests Were Needed to Identify Substance 'It was Nothing Harmful ' FBI Says " *Washington Post*, 29 April 1997 B2 Rene Sanchez, "California Anthrax Threats Spawn Costly Wave of Fear," *Washington Post*, 11 January 1999 A1 Maria Elena Fernandez "Anthrax Hoaxes are Sent in Mail, Threatening Letter Delivered to Post " *Washington Post* 5 February 1999 B8

world.[6] The global AIDS epidemic continued unabated, and a number of diseases that had been controlled for years through various drug regimens, such as tuberculosis and malaria, developed new strains that were resistant to some or all forms of treatment. New diseases also appeared within the U.S., including Lyme disease, Legionnaires disease, and hantavirus pulmonary syndrome, and Ebola briefly reappeared in Zaire, now the Democratic Republic of Congo.[7] In addition, creutzfeldt-jakob disease ("mad cow disease") and influenza demonstrated the ability of infectious diseases to "jump" from animals to humans.

The costs of these natural outbreaks has been staggering. In terms of human life, AIDS alone has killed millions of people and has the potential to decimate entire generations in countries with the highest rates of infection.[8] Diseases such as cholera have complicated refugee relief efforts, and disease outbreaks have had a devastating impact on the economies of both developed and developing countries. For example, it is estimated that the United Kingdom lost approximately $5 billion in export sales when an outbreak of creutzfeldt-jakob disease triggered a three-year European Union embargo on U.K. beef.[9] An

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[6] NSTC Committee on International Science, Engineering, and Technology, *Global Microbial Threats in the 1990s Report of the CISET Working Group on Emerging and Re-emerging Infectious Diseases*, executive summary, available on internet at www whitehouse gov/wh/eop/ostp/ciset/html/ciset html

[7] Ibid

[8] Since HIV was identified in the 1970s, over 47 million people have been affected and 14 million have died In 1998 the death toll was 2 5 million people In Botswana Namibia Swaziland, and Zimbabwe between one fifth and a quarter of the people between the ages of 15 and 49 are afflicted with HIV or AIDS AIDS in the Third World A Global Disaster," *Economist* 2 January 1999, 42

[9] T R Reid European Union Votes to Remove Worldwide Ban on British Beef," *Washington Post* 24 November 1998 A26 In addition to the loss of export sales, the cost of the cattle cull and other measures implemented to control the outbreak is expected to reach $5 8 billion by the year 2000 Britain Cull MAFF' *Economist* 28 November 1998 61

outbreak of plague in India resulted in the suspension of all air and sea traffic from India to many other countries and embargoes of Indian fruit, vegitables, and other food products. Lost export revenue in one week alone was estimated at $645,000.[10]

The 1998 national security strategy for the United States, entitled "*A National Security Strategy for a New Century,*" states:

> The goal of the national security strategy is to ensure the protection of our nation's fundamental and enduring needs: protect the lives and safety of Americans, maintain the sovereignty of the United States with its values, institutions and territory intact, and promote the prosperity and well-being of the nation and its people.[11]

Based on the forgoing, it is clear that infectious disease, whether naturally occurring or purposefully introduced, has the capability to complicate and frustrate efforts to achieve every facet of this goal. This paper will examine the different elements of the infectious disease threat and will identify potential opportunities arising from the unique nature of the threat. The Clinton Administration's expanded dual-track approach to strategy in this arena will be considered and potential problems will be identified Finally, the paper proposes formulating a comprehensive infectious disease control strategy to better address this complex threat and makes some recommendations regarding its content.

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[10] World Wire Plague Weakens Indian Economy,' *Wall Street Journal*, 3 October 1994, A16

[11] The White House, *A National Security Strategy for a New Century* (Washington, D C , October 1998), 1

Four Coming Plagues

The threat posed by infectious disease can be divided into four elements: military use, terrorist use, disease importation, and domestic outbreaks.[12] Considerable overlap is possible between these elements, and the circumstances surrounding a particular outbreak may frustrate efforts to characterize the situation on the ground. Nevertheless, conceptualizing the threat in this way is important because it reveals critical assumptions that have developed over time as strategists have struggled to deal with the infectious disease threat. Because these assumptions have formed the basis for prioritization in the application of means to ends, they merit closer examination.

Military Use

Military use of infectious disease has historically involved the purposeful introduction of an infectious disease by military forces onto the battlefield or into a city in order to destroy enemy forces or break the enemy population's will to resist.[13] Over the course of the twentieth century, technological advances caused strategists to assume that modern military use would consist of the following elements. Military forces would use sophisticated delivery systems,

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[12] For the purposes of this paper, the direct use of biologically-produced toxins is not included in the infectious disease threat since toxins are not infectious agents The use of intoxicating agents, i e infectious agents such as botulinum that reproduce within the body and kill by means of intoxication, would fall within the scope of the infectious disease threat

[13] The first known use of disease by military forces occurred in 13–6 when bodies of soldiers who had succumbed to plague were catapulted over the walls of a besieged city The Japanese military subsequently used biological weapons against Chinese forces during World War II Javed Ali, et al *Jane s Guidebook* 75

such as bombs, artillery shells, missile warheads, or spray tanks mounted on high-performance aircraft, to attack enemy troops or enemy population centers.[14] The actual attack would take the form of an aerosol containing multiple kilograms of a virus or bacterium that had been milled to the ideal particle size for inhalation and infection, and had been treated to maximize its stability and persistence in the targeted environment. The attack would take place under favorable meteorological conditions in order to maximize the rate of enemy infection and minimize risks to the attacking forces. Finally, the virus or bacterium used would be highly virulent, and non-endemic, thereby exploiting the lack of natural defenses in the targeted population.[15]

Terrorist Use

The definition of what constitutes terrorism is subject to considerable debate. Nevertheless, a terrorist attack using infectious disease most likely would involve the purposeful introduction of an infectious disease by an individual or member of a terrorist group into a heavily populated area for purposes of infecting or killing large numbers of people, thereby triggering terror and panic in the larger population.

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[14] Recently, Col Larsen, USAF and Lt Col Kadlec USAF MC, have raised the possibility of asymmetrical warfare including infectious disease attacks on critical air and sea ports in order to infect civilians employed by the U S military who are loading and unloading military equipment This provides an excellent example of how the distinction between the different elements of the threat can be blurred Randall J Larsen and Robert P Kadlec 'Biological Warfare A Silent Threat to America s Defense Transportation System ' *Strategic Review*, Spring 1998, 5

[15] Genetic manipulation of the agent could be used to enhance its virulence and transmisibility or to target a particular ethnic group Ethirajan Anbarasan "Genetic Weapons A 21st – Century Nightmare?,' *Unesco Courier* March 1999 37

The characteristics of a terrorist attack would vary widely, depending on the size, competence, and sophistication of the individual or terrorist group. Nevertheless, it has generally been assumed that terrorist use would be considerably smaller in scale and less technically sophisticated than military use. Thus, delivery systems, if used, would be cruder and the infectious disease disseminated would likely be whatever agent was available to terrorist rather than the agent that would be most effective against the targeted population. Small quantities of agent (grams) would be used, due to acquisition problems and the potential for discovery if large quantities were involved. If aerosolization was attempted, particle size would be less than ideal and the particles would be susceptible to temperature changes and exposure to ultra-violet light. As a result, such attacks would take place indoors, in places of high human density, such as subways, office buildings, and shopping malls

It should be noted that the proliferation of terrorist groups, information, and biotechnology over the course of the 1990s challenges the validity of the above-cited assumptions. The technical sophistication demonstrated by Aum Shinrikio in its chemical and biological suggests that at least some terrorist use could more closely resemble military use in the future

Disease Importation

Outbreaks of non-endemic diseases in the United States over the past 50 years have generally been localized events. Incidents of infected airline passengers arriving in the United States have rarely resulted in widespread

outbreaks of disease. Likewise, the importation of infected animals, animal products, or other foodstuffs has rarely resulted in secondary infections in the larger community. As a result, public health officials came to assume that imported disease outbreaks would be relatively small scale and would likely be detected either at the point of entry to the United States or soon after, making them relatively easy to control.

As with terrorism, however, the experiences of the 1990s have challenged these assumptions. The AIDS epidemic has demonstrated that a disease with a long incubation period and few early symptoms can spread throughout the country with devastating effects. Globalization increases exponentially the number of venues for importation of disease, and the variety of infectious diseases that can arrive on our shores. In addition, most health professionals agree that there has been a resurgence of infectious diseases throughout the world.[16]

Accordingly, the possibility of another widespread outbreak of a disease not endemic to the United States, to which Americans have little or no natural defenses cannot be dismissed.[17] The threat posed by any particular outbreak will depend primarily on the characteristics of the disease, the distribution of infected persons, animals, or food following entry into the U.S , and the ability of health care providers to recognize and control the disease before it spreads. It is

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[16] NSTC Committee, *Report of the CISET Working Group*, executive summary

[17] History suggests that widespread outbreaks of disease are the norm rather than the exception For a discussion of past and present outbreaks, see Michael B A Oldstone *Virsuses, Plagues and History* (New York Oxford University Press, 1998)

reasonable to assume, however, that heavily populated areas that are centers of international travel and trade are the most likely sites for such outbreaks. Certain segments of the population, such as children and the elderly will also be subject to higher risk from this threat.

Domestic Outbreaks

After a long period of decline, following the 1918 influenza pandemic, infectious disease mortality in the United States has begun to increase.[18] During the last two decades a number of new diseases have appeared in the U.S., including Lyme disease, Legionnaire's disease, and hantavirus pulmonary syndrome. In addition, new drug-resistant strains of endemic diseases have emerged, such as multidrug-resistant tuberculosis and pneumonia. As a result, the assumption that endemic diseases in the U.S. will remain under control is somewhat suspect.

Characterizing this emerging threat is, by definition, extremely difficult. Nevertheless, outbreaks of newly emerging or re-emerging diseases will likely occur in areas of dense population or where people are routinely in close contact with large numbers of animals. The presence of vectors such as mosquitoes may also be a factor, as will the relative socio-economic status of certain populations, due the increased susceptibility to disease caused by stress. As with disease importation, the threat posed by any particular outbreak will depend primarily on the characteristics of the disease, the mobility of infected persons or

animals, and the ability of health care providers to identify, characterize, and control the disease before it spreads.

Opportunities for the Strategist

By examining the infectious disease threat as a whole, a number of opportunities become apparent. First, because disease is the instrument of destruction in each of the four elements, new vaccines, drugs or other prophylactics or treatments could potentially have application in all four of the scenarios. This is particularly striking when one considers the recent discoveries in the fields of genetics and microbiology that could lead to entirely new methods of preventing and treating disease [19] The sale of the products resulting from these discoveries could strengthen our economy, and providing them to developing countries would not only reduce the threat to ourselves but would foster bilateral relations.

Second, the telecommunications revolution has drastically improved our ability to respond to all four elements of the threat because it enables rapid identification of disease outbreaks and facilitates the rapid organization and implementation of control and response mechanisms. U.S. support for further

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[18] U S Department of Health & Human Services, Centers for Disease Control and Prevention *Preventing Emerging Infectious Diseases A Strategy for the 21st Century* (Atlanta October 1998) box 1 Available on internet at www CDC gov

[19] Recent discoveries include the mechanism whereby stem cells could be converted into bone cartilage fat and the stroma cells in bone marrow several methods for cloning animals that have been genetically altered to produce medicines and other biological products for use in treating humans, deciphering how the cellular ' immune system works which could provide the basis for the next generation of vaccines Nicholas Wade, 'Discovery Bolsters a Hope of Regeneration *New York Times* 2 April 1999, 18, Rick Weiss, 'Genetically Engineered Calves Cloned, Feat is 'Major Step Toward Making Human Medicines in Milk,' *Washington Post* 21 January 1998 A3, Albert Rosenfeld "New Breeds Down on the Pharm," *Smithsonian* July 1998 9 Joannie M Schrof, Miracle Vaccines,' *US News & World Reports* 23 November 1998, 56

expansion of disease control networks will increase U.S. defenses, strengthen our economy, and improve our relations with other nations and international organizations such as the World Health Organization (WHO).

Third, medical consequence management will be necessary in each element – only the scale, location and level of training of the effected population will vary. Accordingly, provision of training, equipment, and facilities, as well as the development of mobile medical surge capabilities would strengthen U.S. defenses and could reduce the global threat if made available to other nations.

Finally, international cooperation and coordination on any or all of the elements of the threat could lessen the risks to all countries involved. This in turn could improve our relations and provide novel opportunities for cooperation and coordination on other issues as well.

An Expanded Dual-Track Approach

The Federal Government has traditionally responded to the infectious disease threat with a two-track approach. Track one has been a "weapons of mass destruction" (WMD) strategy that has included efforts to minimize or eliminate the military "biological weapons" (BW) threat. Force protection, deterrence, intelligence, and arms control have played important roles in this strategy The military and other national security departments and agencies have traditionally formulated and executed this strategy. Track two has been a "public health" strategy that has included efforts to minimize or eliminate natural infectious disease outbreaks within the United States and around the globe.

Vaccination programs, drug research and development efforts, educational programs, international development programs, and health care programs are the primary tools that have been used in this strategy. Public health officials at the international, federal, state, and local levels have developed and implemented this strategy.

The Clinton Administration has retained the two-track approach but has expanded the WMD track in order to address the rising terrorist threat to U.S. interests. This first track of the Administration's approach can be found in "A National Security Strategy for a New Century," which was issued by the White House in October of 1998.[20]

In the context of the use of WMD against U.S. military forces, the strategy identifies three initiatives that are directly applicable to the infectious disease threat. First, the negotiation of an inspection protocol to the Biological Weapons Convention (BWC) that is designed to ensure compliance with the Convention. Second, increasing funding for military programs designed to enhance biological defense capabilities. Third, the continuation of missile defense development and deployment programs designed to protect deployed forces against theater ballistic missiles armed with WMD or conventional weapons. Development of a limited national missile defense capability by the year 2000 is also included in this initiative.

[20] The White House, *A National Security Strategy*

With respect to possible terrorist use of WMD, the strategy focuses on implementing Presidential Decision Directive 62, which creates a "new and more systematic approach" to all forms of terrorism. This new approach specifically highlights the potential use of biological weapons by terrorists against civilians. It identifies four "critical areas of focus" that form the core of President Clinton's "comprehensive strategy" to protect America's civilian population against BW attack:

- the need to upgrade public health and medical surveillance systems in order to identify pathogens with speed and certainty;
- the need to train and properly equip emergency response personnel;
- the need to create a civilian stockpile of medicines and vaccines to counter the pathogens most likely to be in the hands of terrorists or hostile powers; and
- the need to use advances in genetic engineering and biotechnology to create the next generation of medicines, vaccines, and diagnostic tools for use against BW, while preventing innovations from being applied to BW development.[21]

Track two of the Administration's approach can be found in a document issued by the Centers for Disease Control and Prevention (CDC) entitled "Preventing Emerging Infectious Diseases: A Strategy for the 21st Century." This document sets forth four goals that form the foundation of the CDC's strategy. surveillance and response, applied research, infrastructure and training, and prevention and control.[22]

For "surveillance and response," the strategy calls for strengthening the infectious disease surveillance and response capabilities in the U S and internationally. Surveillance data would be used to detect outbreaks and to

improve public health practices and medical treatment. The "applied research" goal includes improving tools for identifying and understanding emerging infectious diseases, determining risk factors for infectious diseases, and conducting research to develop and evaluate prevention control strategies. "Infrastructure and training" will consist of enhancing epidemiologic and laboratory capacity in the U.S. and internationally, including improving CDC's ability to serve as an on-line reference center for diagnosis of infectious disease. Finally, "prevention and control" envisions the CDC working with other government agencies and private organizations to implement, support, and evaluate disease prevention in the U.S. and internationally. The focus of these efforts will be to help health care providers and individuals change behaviors that facilitate disease transmission.

Potential Problems with the Status Quo

By continuing to adhere to the traditional, albeit expanded, two-track approach, the Administration is incurring a number of risks First, addressing the purposeful use of infectious disease under the rubric of WMD rather than as an element of the infectious disease threat may result in the misallocation of limited resources. Second, by continuing to divide government officials and resources into those dedicated to biological weapons and those dedicated to infectious disease, the government may fail to recognize and realize efficiencies through coordination and cooperation. Third, communication and coordination

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[21] Ibid 20

[22] CDC, *Preventing Emerging Infectious Diseases* viii

breakdowns between these two camps may result in the development and implementation of policies that conflict and that may undermine each other. Because each of these risks could have serious implications for national security they will be considered in greater detail.

Misallocation of Resources

The strategic application of means to ends is driven in large part by the strategist's perception of threats to the national interests and opportunities to advance those interests. Because resources are inevitably limited, a certain amount of risk must be incurred when allocating those resources among the various ends. Therefore, the strategist must consider the full range of potential threats and attempt to identify those threats that are more likely to occur and those with a greater potential to damage the national security The two-track approach frustrates this threat assessment portion of the strategic analysis, and may result in a misallocation of resources.

Conceptually dividing the infectious disease threat into two separate and distinct categories disguises both the nature and the magnitude of the infectious disease threat Analysis of the threat is compartmentalized and subject to the cultural mindsets of the strategists within the two different communities In addition, subdivision of the threat diminishes its relative weight vis a vis other threats being considered, both within each of the strategic forums, and at the macro level.

Evidence of this problem can be found in the 1998 national security strategy and in the President's proposed fiscal year 2000 budget. With the possible exception of terrorist use, the strategy fails to differentiate between nuclear, chemical, and biological weapons with respect to both their likelihood of use and their destructive capabilities. As a result, resource allocation preferences are given to those initiatives that are designed to counter the WMD threat as a whole, such as anti-ballistic missile (ABM) systems, or to counter more than one element of the threat at a time, e.g , chemical-biological detectors and protection systems.

This approach does not take into account critical differences between the nuclear, chemical, and biological threats. Infectious diseases are much easier to produce and use as a weapon than nuclear materials or toxic chemicals. Nearly all of the technology and materials required, including the diseases themselves, are "dual use," i.e., they have legitimate uses within the scientific and pharmaceutical communities. As a result they are relatively easy to obtain and can be procured without necessarily drawing attention to oneself. This is particularly true in the terrorism context, where the scale of the attack is likely to be smaller and the delivery of the disease less sophisticated.

Infectious diseases are also potentially far more destructive than nuclear or chemical weapons. Unlike nuclear and chemical weapons, where one becomes a casualty only through direct exposure to the weapon's effects, i.e., blast, heat, radiation, toxic chemicals or toxins, many infectious diseases have

the capability tc spread from person to person by means of inhalation of aerosolized particles, exchange of bodily fluids, or vectors. Thus, although nuclear and chemical weapons have the capability to rapidly create tremendous numbers of casualties within a defined area, infectious disease's effects are not limited in space and time.

The effects of a nuclear or chemical attack are also measurable within minutes or hours of the attack, and are relatively easy to detect. Infectious diseases, however, have an incubation period, measured in days to weeks, during which little or no symptoms are present.[23] This makes it far more difficult to detect, identify, and respond to an infectious disease attack and facilitates the disease's spread.

In light of the greater likelihood of a biological attack vis a vis chemical or nuclear attack and the greater potential for damage posed by infectious disease, it would appear that the Administration has miscalculated the risk posed by infectious disease. As a result, the Administration's preference for WMD initiatives, such as ABM systems, CBW protective equipment, and training "first responders" may increase the risks to our national security by drawing funds away from programs specifically tailored to counter the infectious disease threat

In addition, the WMD community's propensity to focus on high-tech solutions to "weapons" threats may result in decisions to fund programs that are extremely costly and relatively ineffective against the wide range of potential

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[23] Javed Ali et al *Jane's Guidebook* 77, table 1

uses of infectious disease. For example, significant resources are being expended in order to develop stand-off biological detectors that would be useful in a battlefield situation but would have little utility in an urban environment – the likely situs of asymmetric warfare or a terrorist attack. Reallocating these resources toward vaccination and other medical programs as well as low-tech solutions such as light-weight surgical-type masks that could be worn during periods of high risk could prove far more effective over both the short and long term.

In addition to these potential resource allocation problems in the context of WMD, the two-track approach may also result in misallocation of resources at the macro level. Categorization of threats at the macro level is essential because it is impossible to consider and weigh every potential threat to United States' national interests simultaneously. As a result, the characterization of a particular threat is critical because it will subsequently determine its categorization at the macro level. Because resources are generally allocated by category, based on the strategist's risk assessment across the various categories of threats, mischaracterization of a particular threat may lead to a misallocation of resources.

This may be the outcome of the Administration's two-track approach with respect to infectious diseases. By characterizing military use and terrorist use of infectious disease as a "weapons" threat, these threats are placed in the WMD category The WMD category is then balanced against the "public health"

category which includes natural outbreaks of infectious disease. Under the current approach, the strategist is likely to determine that although the WMD threats are less likely to occur than the public health threats, the potential damage to U.S. national interests would far exceed that of the public health threats taken as a whole. Therefore, the strategist's resource allocation would probably favor the WMD category over the public health category.

Re-characterization of the "biological weapons" threat as an infectious disease threat would dramatically alter this assessment. Military use and terrorist use of infectious disease would be shifted into the public health category of threats and considered together with ongoing and potential natural disease outbreaks. When viewed in this manner, the strategist would probably conclude that the public health threats were far more likely to occur than WMD threats since infectious disease outbreaks are ongoing; globalization and evolution provide numerous opportunities for additional outbreaks; and military and terrorist use of infectious disease is more likely to take place than nuclear or chemical attack. In addition, the fact that military forces or terrorists might intentionally introduce an infectious disease into the U.S. to which Americans have little or no natural defense would dramatically increase the potential for the public health category of threats to damage to U.S national interests. Under this new paradigm, resource allocation between the two categories would likely shift in favor of public health in order to mitigate the greater risks posed by the infectious disease threat

Coordination and Cooperation

Coordination and cooperation is inherently difficult when dealing with the infectious disease threat, due to the vast array of entities involved. The Federal Government's effort alone includes: the Department of Agriculture (USDA); the Commerce Department; the Department of Defense (DoD); the Department of Health and Human Services (HHS), particularly the Centers for Disease Control (CDC), the Food and Drug Administration (FDA), and the National Institutes of Health (NIH); the Department of Justice (DoJ), particularly the Federal Bureau of Investigation; the State Department; the Treasury Department, particularly the Customs Service; the Environmental Protection Agency; the Federal Emergency Management Agency (FEMA); the Intelligence Community (IC); the National Security Council (NSC); the U.S. Agency for International Development; and the White House Office of Science and Technology Policy.[24]

In addition to the Federal Government, critical roles are played by: State and local governments, whose public health departments, national guard, and local first responders have primary responsibility for the health and safety of their citizens; the pharmaceutical industry and the academic community, which conduct research and development and provide vaccines and drug treatments; the health care and medical communities, which are likely to be the "first responder" in most outbreak situations, non-governmental organizations such as

[24] NSTC Committee *Report of the CISET Working Group* forward, The White House *Fact Sheet Keeping America Secure for the 21st Century President Clinton s Initiative on Biological and Chemical Weapons Preparedness* (Washington, D C , 22 January 1999) available on internet at www whitehouse gov

the Red Cross and Doctors Without Borders, that often provide emergency assistance during outbreaks; and international organizations such as the WHO and the United Nations' Food and Agriculture Organization, which initiate and coordinate international programs designed to control and eliminate infectious diseases around the globe. Given the number and complexity of relationships between these various entities, coordination and cooperation in the infectious disease arena is particularly challenging.

The Federal Government's traditional two-track approach has divided government entities into the biological weapons camp and the infectious disease camp, which has encouraged private entities to follow suit. Such a division of labor is understandable given the complexity of the infectious disease problem, the number players involved, and their relative expertise. It also reflects traditional conceptual divisions between national security issues and public health and welfare issues. Furthermore, the resource, legal liability, and public perception implications of expanding an entity's responsibilities beyond those strictly associated with one camp or the other have often reinforced this division. Nevertheless, the current approach creates significant potential for inefficiencies due to the lack of coordination in efforts to combat the infectious disease threat. This is particularly apparent with respect to three ongoing initiatives.

Networks

As noted above, the ability to leverage telecommunications technology in order to facilitate rapid identification of outbreaks and to organize and coordinate

rapid responses to such outbreaks constitutes a significant opportunity for advancing U.S. interests. Therefore, it is not surprising that a number of organizations have established, or are preparing to establish, various types of internet-based surveillance and response systems. The potential problem is that these networks may duplicate each other, thereby diluting the value of the data they collect, and access to any particular network may be limited either by technological interoperability problems or by requirements to join or contribute to the operating entity in order to gain access to its network.

A brief survey of networks illustrates the point. The WHO has established several disease monitoring networks, as well networks connecting WHO-collaborating laboratories designed to provide early warning concerning outbreaks as well as to pass infectious disease information to local health officials. Similarly, the Federation of American Scientists, a prominent non-governmental organization, established ProMED-mail in 1994 "to serve as a prototype for the communications system that will be needed to monitor emerging infectious diseases globally." ProMED-mail is currently operated by SatelLife, a division of the NGO International Physicians for the Prevention of Nuclear War [25]

Several Federal programs are also underway. In November of 1996, public health officials from the U S. and Europe agreed to establish a global early warning network to alert doctors and governments about emerging epidemics.

[25] Information regarding these networks can be found on the internet at www OMS ch and www FAS org

U.S. officials indicated that the network was being created because they were not convinced that the WHO or any other organization had sufficient resources "to do the job."[26]

In 1996, the CDC, FDA, and USDA established the Foodborne Diseases Active Surveillance Network within the CDC's state-based Emerging Infections Programs (EIPs).[27] This network is designed to provide active surveillance for diseases caused by foodborne pathogens, to conduct case-control studies to identify risk factors, and to conduct surveys to assess medical and laboratory practices.[28] Between 1996 and 1997, CDC established three provider-based sentinel networks: the Emergency Department Sentinel Network for Emerging Infections (EMERGEncy ID NET), which monitors a number of syndromes; the Infectious Diseases Society of America Emerging Infections Disease Network (IDSA EIN), which regularly surveys its members on topical issues in clinical infectious diseases and enhances communication during outbreak investigations, and the Sentinel Network of Travel Medicine Clinics (GeoSentinel), which monitors temporal and geographic trends of infectious diseases among travelers, immigrants, and refugees.[29] In addition to these existing networks, diplomats negotiating a protocol to the Biological Weapons Convention are also discussing

[26] "Worldwide Network to Warn of Epidemics Under Plan U S and European Governments Will Take Lead in Reporting Outbreaks," *Washington Post* 28 November, 1996 A19
[27] CDC *Preventing Emerging Infectious Diseases*, 18
[28] Ibid
[29] Ibid 19

the possibility of establishing a separate disease surveillance network as an element of the new inspection regime.[30]

First Responders

The 1998 national security strategy identifies the need to train and equip emergency response personnel at the federal, state, and local level as one of the four "critical areas of focus" of the Administration's strategy to protect U.S. civilians from biological weapons.[31] Although there is still some debate as to who exactly these first responders would be,[32] given the significant problems associated with detecting and identifying a terrorist attack using infectious disease, the dramatic increases in funding for this initiative have brought forth no shortage of trainers for these first responders.

The President's FY 2000 budget proposes funding for at least five different government entities to train first responders to react to a WMD attack. Funding would be broken out as follows: $39 million for DOJ; $31 million for the "National Security Community, i.e , DoD and IC; $12 million for FEMA; $2 million for Department of Energy; and $2 million for the Department of Transportation.[33] The funding of such a wide range of agencies and departments is perhaps understandable since training is designed to cover local response to nuclear,

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[30] The rolling text" being considered by the Ad Hoc Group contains proposals to establish an international information exchange network which facilitates the possibility of continuous participation by national experts in the Organization's activites ' and to create ' a framework for donor countries, to support an international system for the global monitoring of emerging diseases in humans animals and plants ' Rolling Text, Article VII, paragraph 12, available on internet at www brad ac uk

[31] The White House *A National Security Strategy* 20

[32] For example see the first responder discussion in Jonathan B Tucker, National Health and Medical Services Response to Incidents of Chemical and Biological Terrorism " *JAMA*, 6 August 1997 362

chemical and biological attack. Nevertheless, it is significant that in both FY1999 and FY2000, HHS has not received any funding for training first responders. The President's biological weapons initiative does include a proposal for $16 million to fund 25 new local emergency medical teams that will respond to "a biological or chemical weapons emergency." [34] However, the relationship, if any, between these medical teams and "first responders" in the event of a BW attack is unclear.

With at least five separate agencies and departments involved in training first responders and over $80 million potentially available, duplication of effort and lack of coordination may be difficult to avoid. Unfortunately, the Administration's two-track approach will likely exacerbate this problem, particularly since there appears to be little distinction made between the nuclear and chemical threats and the infectious disease threat.

Research and Development and Stockpiles

The 1998 national security strategy indicates that the Federal Government will coordinate research and development efforts to use advances in genetic engineering and biotechnology to create the next generation of medicines, vaccines and diagnostic tools for use against biological weapons. It also proposes the creation of a civilian stockpile of medicines and vaccines to counter the pathogens most likely to be in the hands of terrorists or hostile powers. Both

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[33] Office of Management and Budget *Report on Government-wide Spending to Combat Terrorism* (Washington D C , March 1999), attachment C

[34] The White House *Fact Sheet* 22 January 1999

of these initiatives are identified as "critical areas of focus" for the biological weapons strategy.

These initiatives will provide the most effective defense against the infectious disease threat over both the short and long term. Unfortunately, however, the emphasis placed on countering the weapons threat may reduce their potential effectiveness. As an initial matter, the increased emphasis on, and funding for, applied research, i.e., research to produce medicines, vaccines, and diagnostic techniques *for use against biological weapons*, may draw scientists away from research involving naturally occurring diseases as well as basic research that could have applications across the entire spectrum of the infectious disease threat.[35]

The dual-track approach also calls into question the extent to which the results of this research and development initiative will be made available to industry, academia, and the international community. Those with a weapons focus will likely resist such efforts on the grounds that releasing this information will reveal critical vulnerabilities, thereby threatening our national security Nevertheless, these discoveries could have significant utility in combating natural outbreaks of infectious disease and could reduce our exposure to imported infectious disease if made available outside of the U.S. Unfortunately, by

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[35] In his book *The Golden Helix*, Nobel Prize winner Arthur Kornburg argues persuasively that resources should not be taken from basic research in order fund applied research Kornburg cites several applied research projects that yielded no useful discoveries in the targeted area but revealed information that proved critical in totally unrelated areas Kornburg concludes 'Discoveries are so commonly serendipitous that the best plan would seem to be no plan For lack of essential knowledge, timetables for assaults on particular disease targets have little meaning Targets and focus must continually change " Arthur Kornburg *The Golden Helix Inside Biotech Ventures* (Sausalito University Science Books 1995), 11

compartmentalizing this effort, the ability to weigh these competing interests may be frustrated.

Likewise, the proposal to create a civilian stockpile of medicines and vaccines to counter those pathogens most likely to be in the hands of terrorists or hostile powers raises questions of coordination and efficiency. For example, it is unclear whether, and if so under what circumstances, the domestic and international public health community would be able to draw from these stockpiles to counter a natural outbreak of infectious disease. This is particularly troubling when one considers the difficulties associated with determining whether an infectious disease outbreak is a terrorist attack or a natural occurrence. If denied access, the public health sector may create its own separate stockpiles, thereby further reducing efficiency

Conflicting Policies

Perhaps the biggest potential problem with the Administration's continued adherence to the two-track approach is that implementation of two separate strategies by two separate communities will result in the development and implementation of policies that conflict and that may undermine each other. Given the number of entities involved with infectious diseases and the breadth and depth of the infectious disease threat, it is not difficult to imagine such problems arising. Unfortunately, there is evidence that this is already occurring in three different policy areas: BWC protocol negotiations, biotechnology regulation, and smallpox destruction.

BWC Protocol Negotiations

The 1998 national security strategy indicates that the United States is negotiating with other BWC member states in an effort to develop a protocol "that would implement an inspection system to deter and detect cheating," thereby "ensuring compliance with the convention."[36] An important part of this inspection system would be mandatory national declarations of BW-related information. Unfortunately, the establishment of an inspection systems that is sufficiently robust to "ensure compliance with the Convention" has the potential to seriously undermine three other strategic goals of the administration: deterring terrorist attack; using advancements in genetic engineering and biotechnology to create the next generation of medicines, vaccines, and diagnostic tools; and fostering international cooperation in order to reduce the infectious disease threat worldwide.

Because of the dual-use nature of infectious diseases, ensuring compliance with the BWC through such an inspection system would require expansive national declarations and frequent, intrusive inspections at a wide variety of government, industry, academic, medical, and other facilities. This multilateral system would likely be implemented by international civil servants, who would have access to declared information and on-site access to facilities within the United States.

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[36] The White House, *A National Security Strategy*, 10

In the terrorism context, President Clinton has stated that the Protocol will contribute to deterrence by helping to "keep these weapons away from terrorists."[37] While this may be true with respect to the most sophisticated biological weapons, it ignores the widespread availability of the technology, information, and disease cultures that could be used to make a crude but effective terrorist weapon. More importantly, however, the implementation of this system could undercut efforts to deter terrorist attack by revealing U.S. counter-terrorism capabilities and thereby exposing potential U.S. vulnerabilities. In addition, the extent and nature of U.S. counter-terrorism cooperation with other countries could also be exposed, potentially discouraging such cooperation in the future.[38]

The critical mitigating factor in this potential conflict is the extent to which information obtained through declarations and inspections would be distributed. At a minimum, such information will likely be distributed to the parties to the Protocol since to deny them access to this information would prevent them from mutually ensuring compliance with the BWC. As a result, state sponsored terrorists would have access to this information if the sponsoring state was a party to the protocol. In addition, limiting distribution to the parties to the protocol may not prevent independent terrorist organizations from obtaining this information, either through infiltration of the international organization or a state

[37] Remarks by President Clinton on Keeping America Secure for the 21st Century made at the National Academy of Sciences Washington, D C 22 January, 1999, available on internet at www whitehouse gov

[38] The 1998 national security strategy indicates that the leaders of Canada France Germany Italy, Japan Russia the United Kingdom, and the United States agreed in 1997 to exchange information on technologies

party, or by electronic infiltration of computer systems or communications. Since deterrence depends in large part upon creating uncertainty in the mind of the terrorist regarding the potential for success of an attack, a group that obtained this information might not be deterred from launching an infectious disease attack on the United States.

A much more significant conflict lies at the intersection of the BWC inspection system and the scientific and biotechnology communities. If the Administration intends to use advancements in genetic engineering and biotechnology to create the next generation of medicines, vaccines, and diagnostic tools, it can only do so with the cooperation and assistance of the biotechnology industry and the scientific community. Thus, fostering and maintaining excellent relations between the Federal Government, industry, and academia is essential to the success of this initiative In addition, the continued strength and well-being of these institutions is an obvious pre-requisite for the successful achievement of this goal.

The implementation of a BWC inspection system has the potential to significantly undermine these efforts in several ways. First, the imposition of reporting requirements and international inspections on industry and academia would further increase the already significant costs incurred by these institutions in order to comply with existing governmental regulations Second, an adversarial relationship will almost certainly develop during an industry

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to detect and deter the use of WMD in terrorist attacks The White House, *A National Security Strategy* 16

inspection due to the government's desire to demonstrate treaty compliance through transparency conflicting with the inspected entity's desire to protect sensitive information and areas, and to minimize the cost and disruption caused by the inspection. Third, providing international inspectors with access to an institution's facilities and records puts that institution's proprietary information at some level of risk. Because many biotechnology firms and academic projects spend the vast majority of their resources pursuing one or two specific discoveries, the loss of research or development information could prove fatal to the institution. Finally, public fears regarding genetic engineering and treatment of animals has made biotechnology firms and academic institutions pay close attention to their reputations and to public perception of their activities. As a result, public exposure of a bio-defense or counter-terrorism connection through declarations, or publicization of a biological weapons inspection at the facility, could negatively affect an institution's reputation, and consequently its well-being.

Finally, negotiations in Geneva may undercut U.S. efforts to foster international cooperation against the infectious disease threat. Such efforts have traditionally been led by the World Health Organization and various international development organizations. The establishment of the Ad Hoc Group, however, has created an additional forum for the discussion of these issues since the group's mandate includes an obligation to consider "specific measures designed to ensure effective and full implementation of Article X" of the convention, in

which the parties undertake, *inter alia*, to "facilitate, and have the right to participate in, the fullest possible exchange of equipment, materials and scientific and technological information for the use of bacteriological (biological) agents and toxins for peaceful purposes."[39] Article X also requires "Parties to the Convention in a position to do so" to cooperate in contributing to the further development and application of scientific discoveries in the field of bacteriology (biology) for prevention of disease, or for other peaceful purposes."

Discussions in this new forum may undercut existing efforts in two ways. First, developing countries have already indicated that their acquiescence to a BWC inspection system is contingent upon obtaining concessions from developed nations that involve export controls, intellectual property rights, or biotechnological assistance.[40] This has generated considerable rancor in the negotiations, which could spill over into other forums that have traditionally been more cooperative in nature. Second, by conducting simultaneous multilateral negotiations on these issues within the separate tracks of the dual-track approach, the Administration runs considerable risk of putting forward negotiating positions in the different forums that conflict or undercut each other. For example, as pressure builds for conclusion of the BWC protocol, U.S.

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[39] Special Conference of the States Parties to the Convention on the Prohibition of the Development Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction *Final Report*, Geneva 19-30 September 1994, BWC/SPCONF/1 9 available on internet at www.brad.ac.uk

[40] The Director of the U.S. Arms Control and Disarmament agency has stated: Some under the banner of nondiscrimination have sought to make Article X a vehicle for the worldwide obliteration not only of export controls but intellectual property rights as well. But Article X encourages scientific exchange and cooperation it does not rule out restrictions on trade. Remarks of John D. Holum to the Fourth Review Conference of the Biological Weapons Convention, Geneva, Switzerland 26 November 1996 available on internet at www.acda.gov

negotiators may be inclined to make concessions that have been refused in other forums.

Biotechnology Regulation

As noted above, leveraging advances in genetic engineering and biotechnology to create the next generation of medicines, vaccines, and diagnostic tools is one of the "critical areas of focus" for the Administration's biological weapons strategy. However, this weapons-based initiative will inevitably run up against U.S. regulatory policy governing biotechnology and genetic engineering.

In his book entitled "Policy Controversy in Biotechnology: An Insider's View," Henry Miller argues that the current federal regulatory policy is fundamentally flawed because it automatically places a higher regulatory burden on research and development that involves "genetic engineering."[41] Miller contends that the proper regulatory test should be the level of risk that a particular project poses to humans and the environment. However, Miller indicates that adoption of a risk-based regulatory scheme has been frustrated by public fears regarding genetic engineering and regulator's propensity to over-regulate in order to avoid liability and criticism

Hightened regulation of genetic engineering would frustrate implementation of the Administration's BW initiative by significantly delaying the development and approval of new medicines and vaccines that were produced

[41] Henry I Miller, M D , *Policy Controversy in Biotechnology An Insider s View* (Georgetown Texas R G Landes Company and Academic Press Inc , 1997)

using genetic engineering. In addition, the regulatory burden associated with such projects may discourage private industry and academia from participating in the initiative thereby further delaying the development of new medicines and vaccines.

Unfortunately, the Administration's dual-track approach will likely hinder efforts to resolve this conflict. Regulatory officials, who have traditionally belonged to the public health camp, will probably resist efforts to streamline the regulatory process in order to respond to a weapons threat that they may view as improbable or unrealistic. At the same time, BW officials may exacerbate the problem by focusing public and Congressional attention on the threat of "genetically engineered superbugs," in an attempt to secure greater resources for countering the biological weapons threat. Such efforts could trigger a public backlash against genetic research and development as a whole, thereby preventing regulatory reform and frustrating the President's BW initiative.

Smallpox Destruction

Perhaps the best example of conflicting Administration policies arising from the dual-track approach was found in the Administration's position on smallpox destruction At the conclusion of the World Health Organization's successful campaign to eradicate smallpox, stocks of this dangerous pathogen were retained in case the disease re-emerged. These stocks were to be retained in two locations: at the CDC in Atlanta, and at the State Research Center of

Virology and Biotechnology (Vector) in Siberia.[42] In 1996 the WHO recommended that the remaining stocks be destroyed, a decision that was supported by the United States.

The WHO's much celebrated decision was soon followed by disturbing revelations by Dr. Ken Alibek that the Soviet Union had produced large quantities of the smallpox virus for use as a weapon against the United States and had genetically altered the virus in order to increase its virulence and pathogenicity.[43] The national security implications of these revelations were extremely significant. With the successful conclusion of the WHO's eradication project, the United States had ceased inoculating Americans against the disease. As a result, the majority of the American population has little or no natural defense against a highly virulent disease that is easily transmitted and could potentially kill millions

Despite the significance of these revelations, the Administration only recently began to discuss the possibility of changing its position on smallpox destruction.[44] Although the reasons for this delay were not readily apparent, the Administration's dual-track approach was probably a contributing factor. Since the original policy of supporting destruction of the remaining stocks was made by the public health community following many years of effort, these officials

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[42] Judith Miller Panel Says Smallpox Stocks may be Useful. *New York Times*, 16 March 1999 10

[43] David Brown, "Destruction of Smallpox Samples is Reassessed, Some Suspect Virus Also Exists in Secret," *Washington Post* 15 March 1999, A1

[44] In March of 1999, an expert panel convened by the National Academy of Sciences Institute of Medicine found that preserving the samples may provide important scientific and medical opportunities that would be lost if the virus was destroyed The panel's report was requested by the Departments of Defense, Energy and Health and Human Services and provided the basis for the Administration's subsequent reconsideration of its position David Brown "Destruction of Smallpox," A1, Judith Miller Panel Says Smallpox Stocks May be Useful *New York Times* 16 March 1999 10

probably resisted any effort by the weapons community to alter their policy. At the same time, the weapons community likely faced a number of bureaucratic hurdles since there was little history of collaboration between the two communities and the proper forum for addressing this issue was probably not readily apparent.

An Encouraging Trend

Recently, there is evidence that suggests that the division established by the two-track approach is beginning to break down. In a speech at the National Academy of Sciences, on January 22, 1999, President Clinton announced that the U.S. Government "will speed and broaden our efforts[against chemical and biological terror], creating new local emergency medical teams, employing in the field portable detection units the size of a shoe box to rapidly identify hazards; tying regional laboratories together for prompt analysis of biological threats. We will greatly accelerate research and development, centered in the Department of Health and Human Services, for new vaccines, medicines and diagnostic tools " The President then stated that "*these cutting-edge efforts will address not only the threat of weapons of mass destruction ,but also the equally serious danger of emerging infectious diseases.*"[45] HHS Secretary Shalala drove home the point at a subsequent press briefing at which she stated " this is the first time in American history in which the public health system has been

[45]Remarks by President Clinton 22 January, 1999 (emphasis added)

integrated directly into the national security system [and my job] is to be able to provide tracking and treatment for victims."[46]

Additional evidence can be found in the 1998 national security strategy and in the CDC's infectious disease control strategy. In discussing the Presidents comprehensive strategy to protect civilians from biological weapons, *A National Security Strategy for a New Century* states: "we will upgrade our public health and medical surveillance systems. *These improvements will benefit not only our preparedness for a biological weapons attack – they will enhance our ability to respond quickly and effectively to outbreaks of emerging infectious diseases."*[47] Likewise, the CDC's *Preventing Emerging Infectious Diseases: A Strategy for the 21st Century* states "CDC will explore new approaches for the identification of unusual events, including diseases of unknown etiology *and diseases caused by the deliberate release of pathogenic agents by a terrorist or as a weapon of war"*[48]

Perhaps the most encouraging evidence was provided on April 23, 1999, when the Administration announced that it would join Russia in opposing the destruction of the remaining smallpox virus stocks [49] Both the national security and public health communities were involved in this decision and the decision reflects a careful review of the various elements of the infectious disease threat.

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[46] Press Briefing by Attorney General Janet Reno Secretary of HHS Donna Shalala and Richard Clarke President's National Coordinator for Security, Infrastructure and Counterterrorism, the White House, 22 January 1999 available on internet at www.whitehouse.gov

[47] The White House, *A National Security Strategy*, 20

[48] CDC *Preventing Emerging Infectious Diseases* 20

[49] Susan Okie U S to Oppose Destroying Smallpox Stocks' *Washington Post* 23 April 1999, A2

Despite these encouraging signs, however, cooperation and coordination between the two camps appears to be at a nascent stage, due to the Administration's continued adherence to the two-track approach. Accordingly, a Presidential decision to formulate a comprehensive infectious disease control strategy is needed because it will signal the Administration's abandonment of the two-track approach and will provide the vehicle for securing the necessary policy and bureaucratic changes.

Toward a Comprehensive Infectious Disease Control Strategy

The formulation of a comprehensive infectious disease control strategy will be a monumental undertaking and is therefore beyond the scope of this paper. Nevertheless, the preceding analysis provides the basis for several recommendations regarding the formulation of such a strategy.

As an initial matter, the infectious disease control strategy should conceptually place the entire infectious disease threat within category of public heath, but should clearly indicate that this threat is a matter of national security Re-categorizing the threat in this manner will more accurately reflect the unique character of this threat and will reduce the chance of misallocation of resources at the macro level. In addition, the re-characterization will force a reassessment of the underlying assumptions in each element of the threat, and will stimulate creative thinking and cooperation

The comprehensive strategy should establish over-arching objectives for countering the threat as a whole and should provide mission-type guidance for

each of the four elements of the threat. An interagency body composed of representatives from the national security agencies and the public health agencies should be established and tasked with developing this strategy. This new entity should be co-chaired by representatives of the NSC and HHS, in order to prevent either of the traditional camps from unduly controlling the process, but should be free to subdivide into working groups as appropriate. State governments, industry, academia, allies, major trading partners, and relevant international organizations and non-governmental organizations should be regularly consulted in order to ensure that goals are realistic and to minimize duplication of effort.

In formulating this strategy, the interagency group will need to consider the entire spectrum of the threat and identify those elements that are most likely to occur and that pose the greatest risk to U.S national security. This will not be easy given the rapid evolution of the threat and many uncertainties associated with each element of the threat. Nevertheless, it would appear that terrorist use and the disease importation are the most likely to occur and pose the greatest threat to national security. In any case, by combining the expertise that has been present in the two traditional camps, a more accurate risk assessment should emerge, thereby improving resource allocation.

The application of means to ends in this strategy should not be driven solely by the group's risk assessment. In addition to risk management, the group should be guided by four general principles. First, the group should draw

upon its collective experience and expertise in order to identify initiatives that would have application in more than one element of the threat, preferably all four. Once identified, the group should consider whether to incur additional risk in a particular area in order to reduce the overall level of risk. For example, the group might choose to acquire fewer high-cost protective suits that are designed to protect against the extremely high doses of agent associated with military use in order to acquire more low-cost less-capable masks that could be used in all four scenarios.

Second, the group should seek lower-cost initiatives that will mitigate risk over the short term in order to commit greater resources toward higher-cost long-term solutions. For example, the group should fund short-term initiatives such as: establishment and coordination of surveillance and response networks; disease education in the general public and medical community; and strengthening the military and civilian medical surge capabilities The majority of resources, however, should be allocated to long-term initiatives such as basic microbiological and genetics research, strengthening regional, local, and mobile diagnostic capabilities, and applied research involving vaccines, medicines, diagnostic techniques, and new medical treatments.

Third, the group should critically examine all ongoing initiatives in order to eliminate or at least minimize any potential conflicts In particular, the group as a whole should review existing U.S. BWC protocol policies and consider whether this effort should be scaled back or abandoned altogether. Likewise, the group

should review the relevant regulatory schemes and determine whether to make changes to the regulations or propose changes to existing laws. Finally, the group should carefully coordinate the implementation of its new policy on smallpox in order to ensure that other initiatives do not undercut this policy.

Fourth, the group must recognize that this is a truly global threat. As a result, the group should look for opportunities to involve other nations, international organizations, and non-governmental organizations in the fight against infectious disease. By supporting existing international efforts and developing new ones, the United States can reduce the risks to itself and project American values worldwide.

Conclusion

As the new millennium approaches, it brings with it an increasing threat of infectious disease. In its totality, this threat has the demonstrated capability to kill our people, undermine our institutions, and devastate our economy. Accordingly, infectious disease poses a significant threat to our national security

The Clinton Administration's response to this growing threat has been to expand, but not abandon, the traditional two-track approach. Unfortunately, continued adherence to this approach may result in the misallocation of resources, a continued lack of coordination perpetuating inefficiencies, and conflicting policies.

Development of a comprehensive infectious disease control strategy would provide the necessary guidance and mechanisms for addressing this

significant national security threat. In addition, a comprehensive strategy could foster international efforts to reduce the global threat.

Admittedly, the formulation and implementation of a comprehensive infectious disease control strategy will not, in and of itself, prevent infectious disease outbreaks in the United States. Nevertheless, it is the first step to an effective, coordinated, and flexible defense against the infectious disease threat To return to Sun Tzu, "one able to gain victory by modifying his tactics in accordance with the enemy situation may be said to be devine."[50]

[50] Sun Tzu, *The Art of War*, 101