THE IMPLICATIONS OF A BIOLOGICAL WEAPONS CONVENTION VERIFICATION PROTOCOL ON U.S. BIOLOGICAL WARFARE NONPROLIFERATION STRATEGY

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Dylan M. Carlson, MAJ, USA
B.A. University of Michigan, Ann Arbor, MI, 1991

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THESIS APPROVAL PAGE

Name of Candidate: Major Dylan M. Carlson

Thesis Title: The Implications of a Biological Weapons Convention Verification Protocol on U.S. Biological Warfare Nonproliferation Strategy

Approved by:

_____, Thesis Committee Chair
Herbert F. Merrick, M.A.

_____, Member
Jacob W. Kipp, Ph.D.

_____, Member
LTC Richard S. Tracey, M.A.

Accepted this 6th day of June 2003 by:

_____, Director, Graduate Degree Programs
Philip J. Brookes, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement).

ABSTRACT

THE IMPLICATIONS OF A BIOLOGICAL WARFARE CONVENTION VERIFICATION PROTOCOL ON U.S. BIOLOGICAL WARFARE NONPROLIFERATION STRATEGY, by Major Dylan M. Carlson, 82 pages.

The threat of biological attack is one of the gravest that faces the U.S. Throughout history epidemics have killed millions and caused massive social upheaval. Science has made great strides in combating disease, however, these advances have allowed proliferating states to develop arsenals of genetically engineered pathogens.

For over a quarter-century, the U.S. has been a world leader in combating the proliferation of deadly biological agents. The U.S. was one of the original signatory states of the 1972 Biological and Toxin Weapons Convention. The current nonproliferation strategy calls for strengthening the treaty yet the U.S. unilaterally opposed a verification protocol that promised to increase accountability of treaty compliance in 2001.

The U.S. became the target of considerable international criticism for this action. However, while the verification protocol promised to strengthen the treaty, it did not offer any guarantees. The unique characteristics of biological warfare research and production pose considerable challenges to any verification protocol. The potential economic, security, and intellectual costs to the U.S. of this program would likely offset any advantages. The U.S. must find a compromise in order to avoid international isolation and prevent diplomatic nonproliferation efforts from being completely eclipsed by more aggressive programs.

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ACRONYMS

ASM	American Society for Microbiology
BW	Biological Warfare
BWC	Biological and Toxin Weapons Convention
CBM	Confidence Building Measure
CIA	Central Intelligence Agency
CWC	Chemical Weapons Convention
DIA	Defense Intelligence Agency
DNA	Deoxyribonucleic Acid
DOD	Department of Defense
FAS	Federation of American Scientists
GAO	General Accounting Office
HUMINT	Human Intelligence
NCV	Non-challenge Visit
NSCWMD	National Strategy to Combat Weapons of Mass Destruction
NSS	National Security Strategy
PhRMA	Pharmaceutical Researchers and Manufacturers of America
UN	United Nations
UNSCOM	United Nations Special Commission
UNMOVIC	United Nations Monitoring, Verification and Inspections Commission
WHO	World Health Organization
WMD	Weapons of Mass Destruction

TABLE

CHAPTER 1

INTRODUCTION

> We have the right to kill four million Americans -- two million of them children -- and to exile twice as many and wound and cripple hundreds of thousands. Furthermore, it is our right to fight them with chemical and biological weapons . . . . America is kept at bay by blood alone.
>
> Suleiman Abu Gheith, al-Qaida Spokesman, June 12, 2002

"Trust but verify." These were the immortal words uttered by President Ronald Reagan in regard to the Strategic Arms Reduction Treaty. In the context of nuclear disarmament, verification of treaty compliance was the cornerstone to the U.S. policy. In Reagan's opinion, "no treaty is better than a bad treaty" (Reagan 1989). Why, then have subsequent administrations been so leery of the verification process in the pursuit of containing the proliferation of biological weapons? Following a stalemate over the verification issue at the 3rd Review of the Biological and Toxin Weapons Convention (BWC), assistant director of the U.S. Arms Control and Disarmament Agency, Michael Moodie, stated, "Given the nature of the biological weapons production process, we know of no way to effectively verify that convention . . . . You can verify what they want you to see, and in that way convey a false sense of security . . . . It tells you nothing about what it might be trying to hide" (Newmann 1991). Moodie made this statement on 11 September 1991. Exactly ten years later, a horrendous act of terrorism would kill over 3000 Americans and would highlight our nation's vulnerability to unconventional attack. This attack came less than a week after representatives of President George W. Bush's administration rejected the verification protocol at the 5th Review of the BWC voicing concerns over verification, as his father had done a decade before. Within a month, an

unidentified assailant mailed five anthrax-laced letters to media and governmental offices in Florida, New York and Washington D.C. ushering in a new era of biological terrorism.

The U.S. Government's rejection of the latest BWC Protocol was a controversial move, especially in the context of the subsequent terrorist attacks. The primary issue in contention was the U.S. view that the verification procedures outlined in the final wording of the protocol would not be effective; and would instead compromise national security, disrupt legitimate research and raise the possibilities of industrial espionage. Of the 147 signatories of the convention, the U.S. was alone in taking this position.

The 2002 NSCWMD proposed that the U.S. nonproliferation effort would pursue "realistic and constructive measures to strengthen the BWC (Bush 2002b, 4). Proponents of the verification protocol claim that an inspection regime would meet those objectives and would also support U.S. counterproliferation efforts by creating an environment that would deter states from pursuing biological weapons (BW) programs. The purpose of this thesis is to examine the utility of a verification regime in the context of current and potential threats.

The Research Question

Is a verification program an effective component of the U.S. BW nonproliferation strategy? It is important to note that this thesis will not attempt to quantify the actual effectiveness of verification inspections. Rather, this thesis will focus on the context of the relationship to U.S. strategy.

Subordinate Questions

1. What is the current BW threat?

2. What are the aspects of U.S. BW nonproliferation strategy?

3. How successful has this strategy been prior to the 5th Review of the BWC?

4. What are the implications to the U.S. of the proposed verification protocol?

Context of the Problem

Background

Historical Examples That Provide Models of the Effects of a BW Attack

Over the last one hundred years there have been a number of naturally occurring and intentionally instigated epidemics and outbreaks of disease. The Spanish Flu of 1918 left 20 million dead worldwide, despite a relatively low 2.5 percent mortality rate. This mortality rate (while ten times greater than a common flu outbreak) attests to the uncontrollable effects of a highly communicable disease. The Japanese initiated the first large-scale military biological attack in the 1930s against the Chinese. They tested strains of several different diseases on Chinese prisoners and dropped literally billions of plague-infested fleas from aircraft. This operation had far-reaching effects, as to this day many Chinese villages experience disproportionately high rates of bubonic plague and typhus. Some of the most lethal disease occurrences of the 20th century were the ebola outbreaks in Africa in the last thirty years. Ebola demonstrated a mortality rate as high as 90% with effects occurring as early as twenty-four hours after exposure. The anthrax attacks that occurred a week after the “911” terrorist attacks killed few. However, the socio-economic disruption that these attacks caused was significant. While it is not commonly known, the anthrax attacks of 2001 were not the first incidents of bio-terrorism. The Aum Shinrikyo

cult in Japan, the same that conducted a lethal sarin nerve gas attack in the Tokyo subway in 1995, had previously attempted up to a dozen unsuccessful botulism toxin attacks over the previous five years (Miller, Engelberg, and Broad 2001, 154). In 1974 the Bhagwan Shree Rajneesh cult conducted a biological attack in Wasco County, Oregon. Using a strain of the salmonella bacterium, a common agent in food poisoning, the group's attack had a significant impact. Although there were no fatalities, 751 victims suffered from varying levels of food poisoning (Miller, Engelberg, and Broad 2001, 19-20). The biological threat is not limited to diseases targeting humans. The Irish Potato Blight from the 19th century and outbreaks of swine fever, hoof and mouth disease and "mad cow" disease all demonstrate the vulnerability of the food supply and the effect that such epidemics could have on society.

Theoretical Effects of Future BW Attacks

There are a number of models that currently exist that demonstrate the potential of an uncontrolled outbreak of a virulent disease in the present day. The Centers for Disease Control have expressed that air travel can allow a pathogen to travel to virtually any place on the globe in ninety-six hours. Two scientists with the Center for Strategic and International Studies offer the following two hypothetical scenarios. The release of two kilograms of anthrax per hour at thirty-five feet above the waterline could potentially cause more than 400,000 fatalities within forty-eight hours. In a second scenario, ten milligrams of botulism toxin introduced into a commercial milk processing plant (after pasteurization) could cause 2,000 to 4,000 casualties with a fifty percent mortality rate (Kupperman and Smith 1993, 41-42). The small amount of agent described in the above examples is significant. Far more shocking were the results of the U.S. government's

recent TOPOFF and DARK WINTER exercises. These simulations exposed the nation's inability to react to BW attacks with contagious pathogens. In these exercises, health care systems quickly became overwhelmed and epidemics raged out of control resulting in unimaginable devastation and loss of life.

Bioengineering has changed the threat to a great degree. New strains of pathogens can be produced in very small laboratories. Laboratories that could once be seen with overhead imagery are no longer necessary, as modern equipment allows for a great reduction in the resources required to produce biological agents. Moreover, advances in this area allow scientist to produce increasingly virulent strains much more easily. For example, an American scientist was easily able to replicate the experiments earlier published by an Australian researcher in which mouse pox virus was engineered with a gene designed to bypass the immune system. For a negligible cost the scientist ordered the gene over the Internet from an American firm that provides genes for routine research (Preston 2002, 221). Within six months a strain was created that was able to completely bypass the immune system of all but the most recently vaccinated mice. The procedures to create this engineered virus would not differ significantly from those required to likewise engineer small pox.

The U.S. concern in this area is not limited to attacks within the United States or against American forces overseas. The U.S. is also concerned with the uncontrollable effects of an epidemic resulting from regional states using BW against each other. The development of long-range delivery means, such as ballistic and cruise missiles has increased U.S. and international concerns.

There has been an increased concern that non-state actors may be acquiring BW capability. In a recent press release an al-Qaida spokesman threatened to "kill four million American's with weapons of mass destruction" (Suleiman Abu Gheith, 2002). Whether this is more than rhetoric is uncertain, but in light of the events of 11 September 2001 such threats must be taken seriously. A captured al-Qaida manual contained instructions on the use of toxin agents. In December 2001, a computer file belonging to Dr. Ayman al-Zaqahri, al Qaida's second-in-command contained a memorandum that complained "despite [biological and chemical weapons'] extreme danger, we only became aware of them when the enemy drew our attention to them by repeatedly expressing concern that they can be produced cheaply" (*Wall Street Journal* (New York), 31 December 2001). The great danger of such groups obtaining BW is obvious. The ability to deter such groups through diplomatic pressure or otherwise is very limited.

Motives to Obtain BW Capabilities

Biological weapons are often referred to as the "poor-man's atomic bomb" due to their inexpensive nature and generally uncomplicated production requirements. The accessibility of "dual-use" technology complicates the problem. Such technology consists of equipment that can also serve legitimate purposes. Scientists can easily translate their technical training toward the pursuit of BW development. Virtually any biological production facility can easily be modified to produce biological weapons. Such facilities and weapons are inherently difficult to detect. States often pursue BW programs as a component of regional arms races, especially in the developing world. Such states may view a BW capability as a counter to U.S. military dominance. Finally, there is the risk that state-sponsored BW capabilities may be used to support associated terrorist elements.

U.S. Strategy

Requirements of International Agreements

The Geneva Protocol of 1925 forbade the use of BW agents, but had no procedure to verify compliance. The BWC of 1972 (ratified by the U.S. in 1975) and the subsequent reviews attempted to overcome this issue. Initially, the BWC called for program transparency and information sharing from all nations, generally known as "confidence-building measures." In later years subsequent reviews have called for a greater degree of compliance verification. The 5th Review that convened in 2001, called for both short notice "challenge" inspections and "non-challenge visits" (NCVs). The U.S. balked at this degree of intrusiveness. The U.S. pursued an aggressive counterproliferation effort through the United Nations (UN) after the Gulf War. In 1991, the UN Security Council passed Resolution 687 that required Iraq to declare and destroy its WMD capabilities. The success of this measure is a matter of considerable controversy.

Aims Laid out in US Internal Documents

Virtually every US strategic document includes countering the proliferation of weapons of mass destruction (WMD) as a critical component of national strategy including priorities for both counterproliferation and nonproliferation. The 2002 National Security Strategy clearly identifies the need for proactive efforts to prevent the proliferation of BW and the corresponding requirement for detection of potential threats. U.S. strategy to combat the BW threat has evolved considerably as the international environment has changed. Advances in the underlying technologies that support BW development have driven the U.S. to pursue increasingly aggressive policies. Chapter four of this thesis will review this in greater detail.

U.S. Policy Assessment

Effectiveness of U.S. Efforts at Countering Known BW Programs

One of the most crucial issues that has hampered the BW counterproliferation effort is the extreme difficulty associated in identifying the threat. As stated above, modern technology and the characteristics of BW agents allow a state or group to potentially conduct research, testing and production in small, easily concealed locations. The nature of clandestine intelligence gathering in this area makes the release of any evidence extremely risky in order to prevent the compromise of the sources and methods. However verifying the existence of a BW threat can take years of dedicated effort. UN inspectors had some success in confirming the Iraqi's program, but the mission took the better part of a decade. There is conflicting evidence on the effectiveness of this internationally mandated disarmament program.

Effectiveness of U.S. Efforts at Deterring Nations from Developing New Capabilities

Anecdotal evidence exists to support an analysis of the effectiveness of the U.S. counter-proliferation effort to date. The Former Soviet Union employed thousands of scientists in the BW production effort. The U.S. has provided funding to 1,655 scientists in 1999. These scientists reported spending twenty-five to seventy-five percent of their time on U.S. funded projects (General Accounting Office 2000, 22-23). However, reports continue that a number of these scientists are assisting foreign governments (and potentially non-state actors) with illicit BW production programs. American, European and Asian universities graduate literally thousands of students each year with the technological expertise to effectively produce and engineer biological weapons (Kupperman and Smith 1993, 36).

Current estimates show a virtually undeniable increase in states pursuing BW programs. In 1972 only four countries had a viable BW capability (Carus 1993, 19). This number increased to "ten or so" by 1993 (Pearson 1993, 15). By 2000, the Federation of American Scientists (FAS) estimated that twenty countries were suspected of "possessing, pursuing or having the capability to acquire" BW capability (Pike, 2000).

Advantages of Supporting Stronger Verification Methods

Verification presents one of the few means by which a state can identify a BW threat prior to the employment or inadvertent release of a BW agent. The proposed challenge inspections could prevent a proliferating from moving or destroying suspect equipment and biological agents. While verification would not be effective in identifying every violation, it could be used to confirm reports from other intelligence means without divulging sources and methods. Stronger verification measures potentially provide a greater deterrent effect to a would-be proliferating state due to the increased risk of being discovered not in compliance. Finally, the world community has demonstrated support for a greater degree of intrusiveness in the inspection process. U.S. intransigence could offend the world community at large making it more difficult for the U.S. to pursue other agendas and sends a message that the U.S. may have something to hide.

Risks of Adhering to Verification Procedures

The U.S. government cited the following concerns regarding the verification protocols. The first was that as even these more intrusive inspection measures will still be generally ineffective due to the nature of the BW threat and because of the inspected state's obstructionist behavior. The fear is that a "negative" finding could provide a false sense of security. Additionally, the U.S. position was that the inspections themselves

could pose a potential threat to U.S. national security by providing information to our adversaries on our protective measures. Additional U.S. concerns involved a risk of industrial espionage against U.S. pharmaceutical companies and a disruption of legitimate academic research. The pharmaceutical and biotechnology industries are multi-billion dollar enterprises. The concerns over proprietary rights cause many industry leaders to fervently oppose a verification program. Any violations of the intellectual property of U.S. corporations resulting from the verification programs bring the potential risk of lawsuits directed against the government. While the legal doctrine of sovereign immunity (also known as the "Feres Doctrine") would generally tend to shield the government from such legal action, the scale of such losses would likely result in legal challenges. The proposed verification regime of the BWC would have offered the same attempt to safeguard proprietary interests as those outlined in the U.S. approved Chemical Weapons Convention (CWC). However, these safeguards rely on the good faith of the inspectors and far from satisfy the legitimate concerns of the pharmaceutical and biotechnology industry and research groups.

Effectiveness of Other Means to Identify BW Threats

The U.S. Congress Office of Technology Assessment (USCOTA) report clearly states that human intelligence (HUMINT) is the most effective means to gain information on BW research and stockpiling. However, Central Intelligence Agency (CIA) has recently been the focus of examination for their weaknesses in HUMINT. Much of this comes as a result of increased reliance on satellite and other technological intelligence gathering systems to the detriment HUMINT operations. Additionally, legislation limiting HUMINT operations have decreased U.S. strength in this area. Defectors have

provided invaluable information on the Soviet Union's and Iraqi BW programs. However, these instances are exceptional cases and the U.S. cannot rely upon them to provide a reliable level of visibility of potential threats in order to support the national security strategy.

The unique nature of BW research, testing and production pose considerable identification challenges. The absolute requirement for containment and the effects of technological innovations have resulted in negligible signatures to support identification by imagery intelligence. Unlike chemical weapons, BW production does not require the acquisition of specialized starting material or precursor chemicals. The products needed to start a BW program are for the most part innocuous material similar to those required for commercial breweries. The exception to this is the seed stock of disease producing organisms. However, foreign researchers can obtain these microbes relatively easily from naturally occurring outbreaks or from institutions such as the American Type Culture Collection that provide genes and strains for legitimate scientific purposes.

Without the ability to verify U.S. suspicions with inspectors, the U.S. will have to rely on allied assistance. The U.S. would be forced to place increased reliance upon the World Health Organization's (WHO) reporting of biological incidents. While an effective source of information, the WHO depends on states to report internal outbreaks of disease. It is unlikely that a state pursuing an illegal BW program would be so accommodating.

Effect of U.S. Rejection of the BWC Protocol on Allied Assistance

Allied diplomats have stated that they felt like they had been lied to after the U.S. rejected the latest protocol. This could result in second order effects of lack of support for

future U.S. agendas. Other governments may not feel the need to share information gained from their inspections with the U.S.

Effect of U.S. Rejection of the BWC Protocol on Adversary Compliance

Adversaries may be more reluctant to submit to verification using the same justification as the U.S. In fact, the U.S. action may have even served to encourage proliferation. Elisa Harris, the National Security Council director for chemical and biological weapons, commented, lack of a clear plan to address biological weapons issues sends "a very bad signal to proliferators that the international community lacks the will to enforce compliance with this agreement [the BWC]" (Leitenberg 2002, 10).

Assumptions

1. The capability to detect BW through use of technology will remain limited.

2. Some signatories of the BWC will continue to develop illicit BW capabilities despite requirements for transparency of research and capability.

3. Advances in Biological Engineering will allow easier development of increasingly lethal BW capability and such development will become increasingly difficult to detect.

Definitions

Biological Engineering: Known as gene splicing; using technological means to edit, rewrite, or rearrange an organism's genetic code in order to achieve a specific capability (Miller, Engelberg, and Broad 2001, 66).

Biotechnology: A broad term used to describe the production of innovative products, devices and organisms through manipulation of biological processes.

Biological Weapons (BW) or Biological and Toxin Weapons (BTW): Biological organisms or toxins that have been produced and processed for the purpose of use against an adversary either to achieve a military effect or for the purpose of terrorizing a civilian population.

BWC: Abbreviation for the 1972 Biological and Toxin Weapons Convention (sometimes abbreviated as BTWC). The more precise name of convention is the Convention of the Prohibition of the Development, Production, and Stockpiling of Bacteriological (biological) and Toxin Weapons and on Their Destruction

Confidence-Building Measures (CBMs): A series of measures outlined in the 2nd and 3rd Reviews of the BWC. The purpose of the measures was to increase openness and cooperation among nations. Such measures include: information on national biological defense programs; encouragement to nations to publish results of bio-medical research; providing information on outbreaks of infectious diseases to the WHO; and promotion of cooperation among the scientific community.

Counterproliferation: "The activities of the Department of Defense (DOD) across the full range of U.S. Government efforts to COMBAT proliferation, including the application of military power to protect U.S. forces and interests; intelligence collection and analysis; and support to diplomacy, arms control, and export controls" (DOD Directive 2060.2 1996).

Nonproliferation: "The use of the full range of political, economic, informational, and military tools to PREVENT proliferation, reverse it diplomatically, or protect U.S. interests against an opponent armed with nuclear, biological or chemical (NBC) weapons and the means to deliver them" (DOD Directive 2060.2 1996).

Transparency: A confidence-building measure based upon openness and a voluntary, free exchange of information.

Verification: An agreed upon system of inspections and other measures to identify noncompliance with convention requirements. (Author's definition based upon stated U.S. perspective at the BWC).

Limitations

Assessing the effectiveness of the U.S. counter-proliferation policy is difficult. Much of the evidence of this would be considered classified and unavailable for research. However, anecdotal evidence of counter proliferation is available. Such examples include the number of states known or believed to have obtained BW capability over the past twenty-five years. Also, the statements of weapons inspectors, such as Scott Ritter, and estimates of nonproliferation organizations and think tanks, such as the Nonproliferation Project and the FAS will prove valuable.

Delimitations

1. This topic is currently an area of intense interest and there is no doubt that it will remain as such in the future. This creates a situation where current information and assessments continue to flood in. To mitigate this problem, all information in this thesis will be current as of 27 January 2003. The significance of this date is that the UNMOVIC published its initial findings on Iraq's weapons program at this time. Their assessment serves to demonstrate the potential effectiveness of a verification program.

2. This thesis will contain only that information that is available through unclassified sources. The focus of this thesis is such that this should not unduly compromise the analysis and findings herein.

3. This thesis will not examine the effect that a verification protocol would have on deterring or countering proliferation by non-state actors. This topic would be a worthwhile subject for further study.

Significance of the Study

The significance of this study is clear. The threat of BW is real, and will continue to take on greater significance as technology creates an environment that simplifies the research, testing, engineering and production of BW agents. In 1998, the Defense Intelligence Agency gravely assessed that "the proliferation of nuclear, chemical, and biological weapons, missiles, and other key technologies remains the greatest direct threat to U.S. interests worldwide" (Cirincione, Wolfsthal, and Rajkumar 2002, 4). Given the subsequent events of the 2001 anthrax attacks, the Global War on Terrorism, and ongoing tensions with Iraq, that assessment is even more germane.

Research Design

The primary research design for this thesis will be one of metadata analysis. This method will involve a comprehensive review of a wealth of information and analysis on this subject. Much of the analysis in this thesis will involve the comparison and evaluation of existing assessments, estimates, and appraisals. Many conclusions will defer to the preponderance of scientific opinion. The research and analysis focus of this thesis will be based on answering a series of secondary and tertiary questions. These questions will place the primary research question in context. The following chapter will provide a more detailed examination of some of the more important documents relating to the central issues of BW proliferation.

CHAPTER 2

LITERATURE REVIEW

The enormous amount of literature on the subject of biological warfare (BW) testifies to the relevance and importance of this area. Research for this thesis covered four basic areas: historical background, threat analysis, policy analysis, and cost-benefit analysis. This chapter will discuss the sources for each area.

Historical Background

The intentional use of biological agents as weapons dates back hundreds. if not thousands of years. The Romans dumped bodies into wells to foul their enemies' water supplies. In the 14th century when the Tartar warlord Tamerlane catapulted the bodies of plague victims over the wall of the besieged city of Kaffa, an act that some theorize sparked the Bubonic plague epidemic that decimated medieval Europe. During the siege of Detroit in 1763, as part of what has become known as the Pontiac Uprising, the British commander, Sir Jeffrey Amherst, directed his subordinates to devise a plan to introduce smallpox amongst the opposing Native American tribes. The subsequent gift of blankets from the smallpox hospital cased an epidemic that swept through the tribes of the entire Ohio River Valley (Preston 2002, 56). For the sake of brevity, this thesis will only examine cases of BW over the last 100 years.

Nature of the BW Threat

The recent history of BW and models to predict the effects of a biological attack are well documented in a number of books, periodicals and Internet sources. The identification of specific states that have obtained or are working to obtain a BW

capability is likewise well documented in the congressional record in addition to the above. National strategy documents strategy and presidential executive orders highlight the dangers generally posed by WMD and specifically by BW.

Government Publications

Presidential Executive Orders. The following in an excerpt from Executive Order 12390 issued by President Clinton on 14 November 1994: ". . . proliferation of nuclear, biological and chemical weapons (weapons of mass destruction) and the means of delivering such weapons, constitutes an unusual and extraordinary threat to the national security, foreign policy and economy of the United States, and hereby declare a national emergency to deal with that threat." (Clinton 1994) This declaration was extended by executive order on 15 November 1995 and again on 14 November 1996.

National Security Strategy (NSS). The NSS of the United States of America dated September 2002 states that Iraq and North Korea are both actively pursuing WMD programs and "other rogue regimes seek nuclear, biological, and chemical weapons as well. These states' pursuit of, and global trade in, such weapons has become a looming threat to all nations" (Bush 2002a, 14).

Congressional Record. In 1989, Dr. Barry J. Erlick, senior biological warfare analyst for the U.S. Army stated that only four countries had BW capability when the US signed the BWC. However, by 1989 the number had increased to ten, clearly showing and increasing threat (U.S. Congress, Senate 1989).

Books

There is a wealth of information detailing biological warfare and epidemics over the last century. Gina Kolata's *Flu* details the influenza pandemic of 1918. Although this

was a naturally occurring disease, the massive scope of the effects is useful in demonstrating the potential outcome of a highly contagious, yet modestly lethal, disease.

The best source on the Soviet BW program is Ken Alibek. A former official of the Biopreparat, the center of the Soviet BW program, he wrote his book *Biohazard* after his 1992 defection to the U.S. He describes in great detail the inner workings of the Soviet BW apparatus. His book is significant as it provides a model of how a state could continue to develop a highly sophisticated offensive BW program despite being a signatory of the BWC. The Soviet violations outlined in *Biohazard* demonstrate the weaknesses of the BWC that relied on only the lofty goals of transparency and confidence building measures to encourage compliance.

Richard Preston, author of *The Hot Zone* (which inspired the motion picture *Outbreak*) has recently written *The Demon in the Freezer*, a well-documented examination of the history and future of small pox. Once thought to be on the verge of extinction, small pox has risen again to pose a potentially catastrophic threat. He describes in bleak detail the ease by which new technology and information on the human genome has allowed bio-engineers to create “designer” microbes. He illustrated an actual experiment in which a researcher was able to cheaply and easily create a super-strain of mouse pox (a close relative of smallpox) in only six months (Preston 2002, 221-223). The advances in bioengineering have made incredible leaps forward. This is clearly demonstrated by the fact that a decade ago Victor A. Utgoff, deputy director of the Strategy, Forces, and Resources Division of the Institute for Defense Analyses, wrote: “modifying an existing agent to give it the characteristics needed to make it a practical weapon promises to be an expensive and complex undertaking” (Utgoff 1993, 30-31).

While there are certainly challenges to the weaponization process, the scientists have definitely cleared the modification hurdle.

The modeling of potential BW effects through both experimentation and simulation is well documented. One of the most comprehensive sources of information is Judith Miller. For her book *Germs* she conducted a great deal of research highlighting the experiments, tests, and evaluations conducted by the U.S. government and the U.S. Army. She interviewed a number of interviews with many of the chief researchers and experts in the area. Robert H. Kupperman and David M. Smith, both scientists who worked in the BW field, likewise proposed several BW attack scenarios in their article "Coping with Biological Terrorism."

This thesis will not deal with the popular fictional accounts of biological attacks carried out against the U.S. However, it is worth noting that such works have had a significant effect on U.S. popular culture, as well as the U.S. government. Of particular significance is Richard Preston's novel *The Cobra Event* that had a significant impact on President Clinton in 1998 who was apparently "impressed by the book's grim narrative and apparent authenticity" (Miller, Engelberg, and Broad 2001, 225).

Other

The Internet has proven to be a source of a great deal of information. A great many articles from distinguished scholars appear on several reliable web sites. The FAS has posted a great deal of information on its web site. The have published findings regarding the countries that are actively pursuing BW programs, and have a number of experts that regularly contribute pertinent information In 2000 Milton Leitenberg, a senior fellow at the Center for International and Security Studies, stated definitively that

12 nations possessed an offensive BW program. He further stated that a terrorist use of a BW agent was "at best characterized as an event of extremely low probability," although it was certainly possible that several groups had expressed an interest in "acquiring" a BW capability (Leitenberg 2000).

Current US Strategy in relating to BW Proliferation of BW

Government Publications

The current NSS identifies three pillars to combat WMD: nonproliferation, counterproliferation and consequence management. This thesis will deal primarily with the first two. The current NSS is a significant departure from those of the past for several reasons. The concept of the "anticipatory defense" (also referred to as "preemption") is the most visible. Most germane to this thesis, the current NSS states that "detection" is a "key capability" that the U.S. must integrate into the military transformation and homeland security systems (Bush 2002a, 14). In a significant departure from several previous NSS documents, the current strategy has any reference to the BWC.

The current NSCWMD provides greater detail to the aims of U.S. programs. The strategy lists the key tenants of the counterproliferation strategy as interdiction, deterrence, defense and mitigation. Under nonproliferation, the some key policies are active nonproliferation diplomacy, multilateral regimes, nonproliferation and threat reduction cooperation, U.S. export controls, and nonproliferation sanctions.

Other

The text of the BWC and the subsequent reviews are posted on the FAS web site (www.fas.org/bwc/bio.htm). The original text of the BWC states that parties to the convention undertake not to develop, produce, stockpile, or acquire biological agents or

toxins “of types and in quantities that have no justification for prophylactic, protective, and other peaceful purposes.” The Senate ratified the treaty three years later, the same year that the U.S. completed destruction of all biological weapons. The first review of the BWC met in 1980 and made no significant changes to convention.

The 1986 second review of the BWC added four “politically binding confidence-building measures” (CBMs). The first was the declaration of all high-security containment facilities. The second was the declaration of unusual outbreaks of diseases. The third was the encouragement of the publication of research results. The fourth was the encouragement of international scientific contracts.

The 1991 third review added three additional CBMs. The first was a pledge to provide information on national legislation related to the BWC. The second was to provide information on their past BW research and development programs. The third was to provide information on state parties’ humane vaccine production facilities. The conference also created the Ad Hoc Group of Verification Experts to “identify measures which would determine whether a State Party is developing, producing, stockpiling, acquiring, or retaining” biological weapons. The fourth review met in 1996, but was unable to agree on measures to strengthen the verification procedures. The conference tasked the Ad Hoc Group to produce a legally binding verification program.

The Ad Hoc Group presented their verification program at the 2001 5th Review Conference. The verification plan consisted of two types of inspections: non-challenge visits and challenge inspections. Despite the support of every other state party, the U.S. refused to support this program. The inspection provisions provided by the Ad Hoc Group were very similar to the already in place CWC inspection protocol. The text of the

CWC is posted on the Organization for the Prohibition of Chemical Weapons' web site (www.opcw.org). The verification annex for the convention included provisions for the conduct of the inspections, procedures to report violations, and a "Confidentiality Annex".

Effectiveness of U.S. Strategy Prior to the 5th Review of the BWC

Government Publications

The current NSS, as well as those over the past decade, have called for both counterproliferation and nonproliferation. Milton Leitenberg's and the FAS's estimates show a marked increase in BW proliferation over the past thirty years. The current NSCWMD accepts that diplomatic nonproliferation alone has had only limited success in preventing states from pursuing BW agendas. The General Accounting Office's report to congress concerning *Biological Weapons: Effort to Reduce Former Soviet Threat Offers Benefits, Poses New Risks*, as the title would indicate offers a balanced discussion of the successes and limitations of the program.

Books

In *Germs*, Judith Miller highlighted the problem with the emigration of Russian biologists. She asserts that U.S. efforts have failed to stem the tide of the emigration of Russian researchers. Ken Alibek in *Biohazard* also outlined the problems raised by emigration as well as recruitment by foreign governments.

Periodicals

Gavin Cameron's article in *Jane's Intelligence Review* supports this claim of an ineffective cooperative support policy. He stated that as of 1996 the average pay of one of the scientists in question was approximately $67 per month. According to Russian media

sources, during the same timeframe, Iran offered almost one hundred times that figure to obtain the services of these experts (Cameron 1996).

Implications of the verification regime outlined in the 5th Review of the BWC

Government Publications

Proponents of the verification program have argued that such an inspection program could be of great assistance in the identification of BW facilities that are so notoriously difficult to find by other means. *Technologies Underlying Weapons of Mass Destruction*, published by the United States Congressional Office of Threat Assessment, goes into great detail in outlining the overall difficulties in identifying BW facilities. This same document also identifies possible indicators that could suggest BW research, production and weaponization. For the most part, these indicators appear very much like a checklist for weapons inspectors, as few of the indicators could be identified by the U.S.'s technological intelligence collection systems.

Books

One of the primary concerns of the Bush administration regarding a verification program has been the argument that inspections would hamper and disrupt legitimate bio-defense research. This point of view appears to be born out by Judith Miller in her book *Germs* when the Congress insisted that the administration conduct mock inspections of several legitimate research installations in 1994 and 1996. According to her the legitimate research could have been presented as violations of the BWC seriously disrupting the activities of these facilities (Miller, Engelberg, and Broad 2001, 300).

In 1993, David L. Huxsoll's article "The U.S. Biological Defense Research Program" brought up similar arguments relating to the impact such intrusive inspections

would have on university research. Such inspections could have a significant negative impact on the willingness of universities and researchers to submit to the inconveniences, distractions and potential accusations of being in violation of the BWC. He stated: “If verification were to have a negative impact . . . academia might revolt, progress on cures for some of the most dreaded diseases might be slowed, and the goals conceived [by the] BWC might never be realized” (Huxsoll 1993, 65).

Periodicals

The *New York Times* printed an expose of the U.S. biological defense programs on 04 September 2001 in an article titled, “U.S. Germ Warfare Research Pushes Treaty Limits.” The article identified several sensitive U.S. biodefense programs that were actively replicating offensive BW threats. Although this issue was quickly overcome by the events of 11 September, the situation put the administration in the uncomfortable position of having to publicly justify sensitive projects. The article seemed to reinforce the administration’s position that adversaries could misuse verification inspections to embarrass the U.S. and jeopardize legitimate defensive-oriented research.

Other

The U.S. position on rejecting the verification protocol was stated in general terms by former BWC ambassador Michael Moody. Specifically, he gave three reasons for the administration’s rejection. First, he stated that the protocol didn’t focus on the “real problem,” because the administration had serious concerns over the compliance of other suspect party states. Second, that the protocol did not “strike and acceptable balance between the “risks . . . and the benefits.” And finally, that the basic approach of the verification protocol was not feasible (Moodie 2001). More specific reasons were cited in

Vernon Loeb's *Washington Post* article "Bush Panel Faults Germ Warfare Protocol." These reasons were that the protocol "would not be sufficient to prevent cheating but would be burdensome to universities and private industry, and might leave U.S. companies vulnerable to theft of commercial secrets" (*Washington Post*, 27 May 2001).

Both the American Society for Microbiology (ASM) and the Pharmaceutical Researchers and Manufacturers of America (PhRMA) have published official positions on their web sites that mirror those concerns. Both organizations state that they are not diametrically opposed to verification inspections. In their respective positions both submit that they would support challenge inspections but would not support a routine inspection program that they expressed are both unnecessary and potentially put "facility reputations at risk" (PhRMA 2000). Both state unequivocally that any inspection program must guarantee their proprietary rights.

The position of the FAS is wholly supportive of a verification protocol to the BWC. The FAS chairperson for the Working Group on Biological Weapons Verification outlined the FAS official position, concluding: "Sooner or later, the United States will have to join in the common endeavor, and we pledge our best efforts to make that happen" (Rosenberg, B.H. 2001b).

Many of the European states, that arguably face the same risks as those outlined by the Bush administration, were angered by the U.S. intractable position regarding the proposed verification protocol. The Verification Research, Training and Information Centre's (VERTIC) press release suggested that the U.S. delegation was not forthright regarding its intention to reject the protocol and that "European diplomats privately accused the U.S. of deceiving them" (VERTIC 2001). In light of recent high-profile

unilateral U.S. rejections of other international accords such as the Kyoto Protocol and the International Criminal Court, this action may have far reaching effects on U.S. relations with its allies.

Summary

As evident from the above, there is a vast amount of material covering virtually every aspect of this subject. The literature mentioned above is by no means a comprehensive listing of every source examined for this thesis. The following chapter will further discuss the methodology by which this thesis will examine the information in order to draw a valid conclusion to the important question of the utility of verification program.

CHAPTER 3

METHODOLOGY

As the previous chapter outlines, this thesis is not based upon original research, but rather will reach a conclusion by analyzing and assessing the field of existing information. The specific method is metadata analysis. This goal of this process is to conduct an objective evaluation of what are at time conflicting opinions and assessments. Because this is not an empirical evaluation, the conclusion will unavoidably be somewhat subjective. In the end, the findings will represent a course of action justified by a preponderance of the evidence rather than an incontestable certainty.

Historical Examples

This thesis is not focused on exploring the history of biological warfare. As a result, the examples cited are neither a comprehensive list of biological warfare events nor will these events be examined in great detail. The purpose of examining the historical record is to highlight the relevance of this issue and to underscore the importance of the U.S. formulating the most effective strategy to combat the threat.

Theoretical Models

While an examination of historical examples of the use of biological agents as weapons is useful, it is presents limitations in drawing complete conclusions. The reality is that although history bears witness to the potentially devastating effects of a biological attack, such attacks have been generally limited in scope and have not approached the full potential of the possible range of effects. In addition to reviewing significant historical events, this thesis will examine some theoretical models to further emphasize some

potential consequences of failure to counter the biological warfare threat. There has been much debate over the parameters and findings of these models. This thesis will not endeavor to determine which of these models is the most realistic. Rather, the thesis will identify similarities from amongst the range of cited examples.

Evaluation Criteria

As stated in the introduction, this thesis will examine whether a verification program would be an effective component of the U.S. biological counter-proliferation program. The use of the word "effective" will no doubt spark some controversy as a result of the imprecise and subjective nature of the term. However, the use of this term is necessary in order to make such a policy evaluation. To clarify the evaluation, I am defining the term "effective" in two ways. The first will be a determination of whether the goals laid down in the most recent and current national strategies are currently being met. This process will determine if a verification program is even necessary, as it would follow that if the U.S. is meeting its counterproliferation and nonproliferation goals than a verification program would not be needed. The second step will be a comparison of the potential benefits of a verification program against the potential costs of the same. In many cases, there are conflicting opinions over these issues. In these cases, the thesis will examine the evidence from both standpoints. This cost-benefit analysis will result in an avoidably subjective analysis, with the conclusion based on the comparative weights of the body of evidence.

Subordinate Questions

In order to reach a conclusion, this thesis will explore the four secondary questions outlined in the introductory chapter. The first issue will be to define the nature

of the current BW threat. The second issue is to define the U.S. strategy in regard to the counter-proliferation of BW. The third issue will be to assess the effectiveness of our current strategy. Finally, the last issue will be to identify the implications to the U.S. of the verification procedures outlined in the latest BWC protocol. Each of these major, or secondary, questions has associated subordinate, or tertiary questions. The thesis will examine each of these areas in order to lay the groundwork for reaching a final conclusion.

DIME Model

A state's power can be generally categorized into four instruments: diplomatic, informational, military, and economic. This "DIME" model is useful in accessing the potential costs and benefits of a verification regime. This thesis will separate the costs and benefits of a verification protocol into the respective DIME categories in order to easily compare the potential positive and negative effects.

Alternatives

The U.S. provided several alternatives after its rejection of the verification protocol. This thesis will examine this plan to identify if it would meet the objectives outlined in U.S. strategy. Additionally, the thesis will analyze the likelihood that these alternatives will be acceptable to the international community.

Summary

The methodology outlined is a road map designed to lead to a conclusion supported by the weight of the evidence. The following chapter will first lay a foundation by defining the threat and outlining the current strategy. There will follow an evaluation of the current U.S. strategy that is essential in determining whether or not a verification

program is necessary. It would follow that if the aims of the current strategy are being met, than no additional procedures are required. However, if the strategy aims are not met, than the U.S. must explore additional options. The final discussion will assess whether or not the risks posed by a verification regime to the national security, pharmaceutical industry and academia outweigh the potential utility of such a program. Finally, this thesis will consider the impact of the U.S. rejection of the protocol on the international community.

CHAPTER 4

ANALYSIS

Historical Examples

The historical record is replete with examples demonstrating the awesome power of the microbe. Europe's bubonic plague epidemics in the middle ages are generally accepted to have devastated the continent, reducing the overall population by roughly a third. Early in the last century, the 1918 Spanish flu pandemic killed almost three times as many people than died in combat during the world war that ended the following year. Despite the mystifying fact that this scourge of humanity has been reduced to a virtual historical footnote, University of Texas historian Dr Alfred Crosby summed up its massive effects: "The Spanish flu . . . killed millions upon millions of people in a year or less. Nothing else -- no infection, no war, nor famine -- has ever killed so many in as short a period" (Kolata 1999, 53).

From 1932-1945, the Japanese conducted extensive BW operations. Despite the significant scope of the their program, the U.S. did not become aware of Japanese activities until after the war ended. The officially named "Water Purification Unit 731" (more commonly known as simply "Unit 731") conducted large-scale operations. Unit 731's BW facility at Pingfan consisted of over 150 buildings. The unit reportedly conducted almost 1000 human autopsies on Chinese nationals and possibly on U.S and allied prisoners to evaluate the effectiveness of a number of BW agents (*New York Times*, 04 March 1999). The Japanese conducted airborne delivery of anthrax, plague, cholera and typhoid over hundreds of heavily populated areas of China. Although there are no

firm figures, the number of Chinese casualties may have ranged from the tens of thousands up to as many as 200,000 (FAS 2000a). After the Japanese surrender, the U.S. and USSR used captured Japanese documents and scientists to expand their BW programs.

The Soviet BW program of the 1980s and 1990s is significant as it represents the most comprehensive effort pursued by any state. When the U.S. unilaterally abandoned its offensive BW program in 1969, the Soviets did not follow suit. In fact, the Soviet program continued to develop for almost twenty years after their signing the BWC. By 1991, the Soviets had tested BW-capable warheads for intercontinental ballistic missiles (Preston 2002, 87-88). The Soviets maintained a constant stockpile of twenty tons of bubonic plague in the city of Kirov alone (Alibek 1999, 166). They also maintained the capability to produce 300 tons of anthrax in a 220-day cycle (Miller, Engelberg, and Broad 2001, 166). By 1994, the Soviet BW group "Vector" had created a 300 gallon bioreactor that within a few week period could produce one hundred trillion lethal doses of smallpox – enough to infect each person on the planet with 2000 infective doses (Preston 2002, 94). At the height of its operations in the late 1980s, the Soviet BW operation employed over 30,000 people and had an annual budget of almost $1 billion (Miller, Engelberg, and Broad 2001, 167). Most odious of Soviet BW advances were in the field of biogenetics. Soviet scientists created strains of anthrax that were immune to multiple antibiotics. Even more sinister, the Soviets created recombinant pathogens that shared traits from separate agents, producing "symptoms of two different diseases, one of which could not be traced" (Alibek 1999, 164-167). The resultant hybrid strains triggered autoimmune responses in test animals, rather than an onset of an identifiable disease. The

end result of these tests was a virtually undetectable, resilient and virulent disease with a nearly 100 percent mortality rate (Miller, Engelberg, and Broad 2001, 302).

The Soviets developed and maintained such capabilities despite their being original signatories of the 1972 BWC. Many scientists in the U.S. refused to believe the Soviets could have been pursuing such an aggressive program. This attitude persisted despite the highly suspicious anthrax outbreak in the Soviet Union in the city of Sverdlovsk in 1979 that killed between sixty-six to ninety-six people. A decade later, the city became infamous as being one of the Soviet Union's major BW production centers. However, following the incident, the Soviets engineered a significant cover-up. The Soviets explained that anthrax-infected meat sold on the black market was to blame (Alibek 1999, 78). The explanation satisfied many distinguished experts. Dr. Mathew Meselson, a Harvard educated biologist who pioneered deoxyribonucleic acid (DNA) research, was one of the key people responsible for convincing President Nixon to abandon the U.S. offensive BW program and helped draft the BWC. In a Senate hearing a decade after the incident he relayed his agreement with the Soviet's explanation going on to state his belief that as far as he was aware "no nation possess a stockpile of biological or toxin weapons" (Miller, Engelberg, and Broad 2001, 94). Others were not convinced of Soviet complicity. One was CIA analyst Douglas MacEachin, head of the CIA's Soviet analysis office from 1984 to 1989, and future CIA Deputy Director of Intelligence (Miller, Engelberg, and Broad 2001, 80). MacEachin has become a champion of a verification regime for the BWC. The other was Nobel laureate Dr. Joshua Lederberg whose recombinant DNA discoveries were instrumental to the development of the Soviet program (Miller, Engelberg, and Broad 2001, 79). The 1989 defection of a top Soviet

biologist, Vladimir Pasechnik, completely exposed Soviet deception and massively increased U.S. appreciation of the Soviet BW program.

Although the BWC had no system for inspections, in light of Pasechnik's disclosures, the Soviets submitted to allowing foreign inspectors into some facilities. Although clearly a risky proposition, due to the size of their BW program, the Soviets went forward with the plan to dispel western concerns. The first such visits occurred in 1991 as part of an exchange between the U.S., Britain, and the Soviet Union. According to Ken Alibek, then the deputy director of the Soviet BW program Biopreparat, even prior to the defection the Soviets made plans for future visits. He stated that in 1988, Premier Gorbachev authorized the development of "mobile production equipment to keep our weapons assembly lines one step ahead of inspectors" (Alibek 1999, 145). During the 1991 visit, the British and American inspectors were systematically deceived regarding the scale and applications of the Soviet program. According to Alibek: "we were as clever and resourceful as Iraq would be nearly a decade later when confronted with similar international suspicions" (Alibek 1999, 147). As would later be the case in Iraq, the inspectors left with no definitive evidence of BWC noncompliance, despite their having had access to specific intelligence information (Alibek 1999, 199). Though they could not prove as much, it was clear to the inspectors, that the Soviets were definitely pursuing an offensive program. The inspection team's final report assessed that the Soviets maintained a "massive, offensive biological warfare program" including research on bioengineering and smallpox (Miller, Engelberg, and Broad 2001, 126).

Most recently Iraq has been the focus of attention for noncompliance with the BWC. A great deal of evidence suggests Iraq has pursued an aggressive offensive BW

program. The situation in Iraq shares many similarities with the Soviet program. The Iraqi BW program received a great deal of governmental support, though the scale of Iraq's program is considerably smaller in comparison. As with the situation with Russia, it was the windfall defection of a prominent official, in this case Saddam Hussein's son-in-law, Hussein Kamel, that provided the international community with a clear picture of the extent of Iraq's BW program. However, the Iraq provides a much clearer picture on the central issue of this thesis: the utility of inspections and the potential for verification.

Despite their cease-fire pledges to destroy all unconventional weapons, subsequent Iraqi actions clearly demonstrated that they had no intention to do so. Initially Iraq failed to admit to having pursued an offensive BW program. The task to verify Iraq's assertion fell to the United Nations Special Commission (UNSCOM). Upon initiating their mission in August 1991, UNSCOM's first leader, Rolf Ekeus, believed that Iraq's statement was a "relatively honest declaration" (Miller, Engelberg, and Broad 2001, 128). For four years the inspectors only identified circumstantial evidence of an Iraqi BW program, such as a freeze-dryer labeled "SMALLPOX" (Preston 2002, 96). The inspectors also identified that the Iraqis had ordered expensive ventilators and centrifuges; bought large quantities of microbial growth media; and had transferred their best microbiologists to work at a supposed cattle-feed plant (Miller, Engelberg, and Broad 2001, 144-149). However, Iraqi deception and obstruction hampered their efforts. Additionally, the CIA's specific information never made it into the hands of the inspectors. As a result, the inspectors only made cursory inspections of bunkers in a facility that the CIA strongly suspected was heavily involved in the Iraqi BW program. In another instance, inspectors unknowingly walked past bombs marked as containing BW

agents, a marking system that would later be disclosed by the Iraqis (Miller, Engelberg, and Broad 2001, 129-131). It was not until the defection of Hussein Kamel that UNSCOM obtained any concrete evidence. When they did, it came from Iraq themselves who made a desperate attempt to preempt what they believed would be Kamel's inevitable disclosures. The information provided inspectors with a detailed listing of Iraq's offensive BW program including: 19,000 liters of liquid botulinum toxin, 8,350 liters of liquid anthrax, 150 R-400 botulinum and anthrax-filled bombs, a 2,000 liter tank for spraying anthrax from an aircraft, and twenty-five Scud missiles filled with biological agents (Miller, Engelberg, and Broad 2001, 185-186). The UNSCOM mission ended in 1998 on the eve of U.S. and British bombardment of Iraq during Operation Desert Fox. The following year, UN Security Council Resolution 1284 established UNMOVIC to pick up the inspection effort where UNSCOM left off. Following a four-year hiatus the UN inspections resumed in December 2002 under the auspices of UNMOVIC. On 27 January 2003, the UNMOVIC chief inspector, Hans Blix, issued his first report to the UN Security Council. As of that date, UNMOVIC had been unable to identify any evidence of an Iraqi BW program, nor could they account for the existence or destruction of Iraq's earlier reported biological weapon stockpiles.

The success of the Iraqi disarmament program has been a matter of considerable controversy. Scott Ritter, former UN weapons inspector has stated that up to ninety-five percent of Iraqi biological materials have been accounted for and destroyed, at least as late as 1998 (*Boston Globe*, 20 July 2002). However, Jon Wolfsthal of the Carnegie Endowment for International Peace Non-Proliferation Project stated concern that Iraq had "on hand -- or could quickly re-create the capability to produce -- vast amounts of

anthrax, tons of material" (Wolfsthal 2002). In the final analysis, the UNSCOM inspectors discovered little of Iraq's BW program based upon their own investigations. They were most effective in verifying Iraq's declarations. Iraq has claimed that it has destroyed all its stocks of weaponized biological agents as well as all BW delivery devices. However, UNSCOM inspectors assessed that Iraq's actual BW production was several times that of their declarations. UNSCOM was unable to confirm Iraq's supposed unilateral destruction of their BW assets, with the exception of finding the remains of about twenty-three R-400 bombs (Cirincione, Wolfsthal, and Rajkumar 2002, 283-284).

Threat Modeling

In May 2000 the Clinton administration evaluated the effectiveness of American civil defense capabilities in the face of a biological threat. Operation TOPOFF, short for Top Officials, tested the coordinated efforts of numerous state and federal agencies in the largest such exercise ever conducted (Miller, Engelberg, and Broad 2001, 270). The exercise took place in Denver on 17 May with a hypothetical lone terrorist releasing pneumonic plague in the air ducts of a Denver auditorium. Within three days 500 people had surged into local hospitals. When the exercise ended on 23 May, the simulated epidemic had spun out of control due to the highly contagious nature plague. Casualty numbers varied from 3700-4000 infections with 950-2000 dead (Miller, Engelberg, and Broad 2001, 273). The disease had completely overwhelmed all efforts at containment. Half of the nation's ventilators had been sent to the city, hospitals and morgues overflowed, panic was out of control, and antibiotic distribution became a debacle as health centers could only serve 140 people, laughably insufficient to meet the demand in a city of 2 million people (Miller, Engelberg, and Broad 2001, 276).

The Center for Strategic and International Studies sponsored the DARK WINTER bioterrorism exercise in June 2001. This simulation focused on the nation's ability to react to a bioterrorism incident sponsored by a hypothetically rearmed Iraq. The exercise starts with health care agencies in Oklahoma, Georgia and Pennsylvania reporting numerous cases of smallpox. One of the critical focuses of the exercise was to assess if an estimated stockpile of 20 million doses of vaccine would be sufficient to prevent an epidemic. The simulation progressed in a similar manner as TOPOFF. Two weeks after the initial incident the number of cases jumped to 2000 with 300 deaths ranging over 15 states. U.S. stocks of vaccine were quickly depleted within the first week of the crisis. After three weeks of the exercise, the simulation takes an ominous turn as a second generation of cases began to appear, that is people who were not exposed to the initial incident but rather contracted the disease after coming contact with the originally exposed victims. Within forty-eight hours of the identification the second generation, the epidemic expanded by 14,000 new cases over an ever widening area. As the exercise ended, experts made projections for a third and fourth generation. In light of a global shortage of vaccine the estimates were horrific. Experts calculated that the third wave would have resulted in 300,000 new cases. The fourth wave would have brought an additional three million new cases with one million deaths. With the epidemic running out of control, mathematically the sixth wave would have torn across the nation killing one out of every three Americans (Biohazard News 2001). The exercise factored that each infected person in the simulation would transmit the disease to ten other people, or in simpler terms the smallpox multiplier was ten (Milloy 2001). There is no established multiplier for smallpox. Most experts accept that the average multiplier for smallpox in modern times is

between three and twenty, based upon data from the most recent smallpox outbreaks, the last of which occurred in 1977 (Preston 2002, 47). However, some experts express the dissenting opinion that even this open range is invalid. Recently, researchers from the Centers for Disease Control have concluded that most outbreaks during the 1960s and 1970s have averaged a multiplier of less than one and that "the probability that the average transmission rate will be greater than two cannot be demonstrated reliably" (Milloy 2001). Nevertheless, the exercise identified critical weaknesses in the U.S.'s consequence management capability.

Threat Evaluation

As stated in chapter two, the number of states having or pursuing BW programs has steadily increased over the last twenty-five years. The FAS estimated that currently twenty states (not all signatories of the BWC) have either acquired a viable BW program or are moving in that direction. In a controversial move, the U.S. named several of them during the 5th Review Conference. Specifically, the U.S. singled out six states as having being in violation of the BWC. U.S. delegate John R. Bolton stated that Iraq, North Korea and Iran possessed offensive BW capability. He went on to name Libya, Syria (which has not ratified the BWC), and Sudan (which is not a state party of the BWC) as states pursuing research and development of a BW program, or in the case of Sudan, interest in doing so. He went on to state that his naming of these specific countries did not constitute a comprehensive list of nations not adhering to the BWC (Bolton 2001).

Such a comprehensive listing of states that possess or are pursuing BW capability is difficult to obtain. The same factors that make BWC compliance to difficult to verify also hinder any attempt to put states in orderly categories. Current estimates very. In 2000

Milton Leitenberg estimated that 12 nations possessed an offensive BW capability (Leitenberg 2000). The FAS provided a somewhat more liberal estimate. Their list included the countries named by Undersecretary Bolton, with the exception of Sudan. The exemption of Sudan was probably due to the assessment that their activity in this area has been limited to an "interest" in pursing a program, an allegation inherently difficult to prove. FAS additionally named: Bulgaria, China, Cuba, Egypt, India, Israel (not a BWC state party), Pakistan, Romania, Russia, South Africa, Taiwan, Vietnam, and the U.S. (Pike 2000). Several of the states on the FAS lists, the U.S. and South Africa for example, have made clear efforts to dismantle their offensive BW programs. However, as these states possess the requisite dual-use facilities and technical expertise necessary to reestablish an offensive program, their names remain on the same list as states with less benign capabilities and intentions.

The export of technical expertise and material from the Former Soviet Union is a matter of great concern. Prior to the breakup of the Soviet Union, Soviet BW scientists trained biologists and bioengineers from Eastern Europe, Cuba, Libya, India, Iran and Iraq (Alibek 1999, 275). After the break-up, the situation make more dangerous. Thousands of Soviet scientists, now unemployed, became targets of foreign recruitment. One American scientist who maintained contacts with his former-Soviet counterparts stated that some BW researchers and some smallpox strains migrated to North Korea in the early 1990s (Preston 2002, 95). Iran, in particular, has aggressively recruited former-Soviet scientists. In May 1997, more than one hundred attended a trade fair in Tehran and the director of Biopreparat reported that he knew of five that currently resided in Iran (Alibek 1999, 272). Russia, even with U.S. monetary, assistance is hard pressed to

compete with the $5,000 a month salaries reportedly being offered by the Iranians (Miller, Engelberg, and Broad 2001, 206). The laws of supply and demand will likely continue to hamper any future efforts to counter the “brain drain” stemming from Russia’s economic challenges.

A BW program is easier to develop and far less expensive than either chemical or nuclear weapons. The availability of “dual-use” technology, equipment that can also serve legitimate purposes, and the corresponding technical training makes the pursuit of BW programs much easier. Biological production facilities are extremely difficult to detect. Some of this is due to the dual-use factor, but additionally production and storage facilities can be very small and easily hidden. Additionally, because lethal doses are so small, BW can be easily delivered, especially when delivery is through clandestine means. States may pursue a BW program in order to intimidate its neighbors, or counter an adversary’s BW program. Such a situation could result in a regional arms race, and could, in theory, create a stabilizing effect resulting from deterrence, in the same vein as the mutually assured destruction concept did during the Cold War (Utgoff 1993, 31). Biological agents are especially desirable as a terrorism weapons due to their extreme potential lethality in small doses. Weight-for-weight BW agents are hundreds to thousands of times more potent than the most lethal chemical warfare agents (USCOTA 1993, 73). Botulism toxin, for example, is the most lethal substance known. If an organization is not averse to causing massive casualties in order to further their causes, biological agents could prove to be an ideal weapon. This situation is all the more dangerous when an organization is unconcerned with the consequences of BW, as was the case with the apocalyptical Aum Shinrikyo cult.

The future of BW is unclear due to rapid scientific advances. However, such technological acceleration will surely allow states to develop increasingly dangerous weapons. While minimal developments can be expected in the effectiveness or lethality of chemical or nuclear weapons, the biotechnology field is making tremendous leaps forward. The Soviet and past U.S. programs demonstrated the capability of translating these advances into a military capability. Soviet scientist conducted their research with limited knowledge of the technical aspects of DNA manipulation. In the decade since the break-up of the Soviet Union, the Human Genome Project has begun to unravel a myriad of mysteries of the basic elements of human life. The ability to access the information from such research, so necessary for curing terrible diseases and bettering the human condition, presents BW proliferators with new possibilities for human suffering. The future holds the reality of new biological weapons that are tailor made to create specific effects. The new technologies available to proliferators will potentially make bioengineering vastly cheaper, easier and potentially more controllable.

Goals of U.S. Strategy

The U.S. strategy to prevent and combat BW threats evolved considerably after President Nixon ordered the abandonment of the nation's offensive BW program in 1969. The subsequent administrations pursued different agendas to combat BW proliferations and expressed different degrees of support for the BWC. The BWC itself evolved through a series of review conference in order to allow the treaty to maintain its relevance in the face of an advancing threat. It is useful to analyze the progression of U.S. strategy and relevant programs in relation to the developing threat and the manner in which the international community attempted to counter it.

Following Nixon's denunciation of an offensive BW capability, the U.S. took the lead in establishing conditions to rid the world of the BW threat. The U.S. was one of the originators of the BWC. This treaty convention took place in the context of the smallpox eradication in the 1970s that came to a "successful" conclusion in 1978 when the last reported case of naturally occurring smallpox was contained in Somalia. Following this event, the U.S. became a repository state, along with Britain and the Soviet Union, for safeguarding the remaining frozen samples of the disease. Through the end of the 1980s, there was generally an optimistic view toward the prospect of BW containment and deterrence. At the time of the signing of the BWC, the U.S. position was that only four states had BW programs, and a number of prominent experts expressed skepticism that other states were pursuing BW programs. The 1980 1st Review Conference of the BWC reaffirmed this sense of confidence, concluding that the treaty was "sufficiently comprehensive to have covered recent scientific and technological developments relevant to the convention" (Dando 1994, 74). Despite some prophetic warnings from the Swedish delegation concerning the potential for new genetic techniques to alter the BW threat, the majority view of the BWC delegations, including the Soviet Union, was that such developments were "unlikely to have advantages over known agents sufficient to provide compelling new motives for illegal production or military use in the foreseeable future" (Dando 1994, 131). Thus the U.S. strategy up to 1980 was to maintain the perceived successful deterrent effects brought about by the BWC.

The situation changed dramatically upon President Reagan's election in 1980. Many in his administration began to suspect Soviet duplicity regarding their BW program following the 1979 Sverdlovsk anthrax incident. The administration also publicly accused

the Soviet's of using BW agents, dubbed "yellow rain," in Southeast Asia and Afghanistan. In 1988, the U.S. government adopted the view that nonproliferation effort over the past fifteen years had not been successful, assessing that the number of countries possessing offensive BW programs had increased from four to ten (Leitenberg 2002). In 1986, Douglas Feith, a senior Defense Department official in the Reagan Administration, outlined the administration's view of the BWC's utility. He told Congress that the "major implication of the new technology is that the BWC must be recognized as critically deficient and unfixable." His view was not based on the treaty's inability to provide for verification, but rather on his concerns with the potential of biotechnological advances (Keppel 2002). While a proponent of the "trust but verify" concept in regard to nuclear proliferation, President and his administration did not believe that BWC verification could provide a similar level of confidence. To combat the perceived threat posed by the Soviet BW program, the Reagan administration authorized a number of "defensive" research projects to assess the capabilities of genetic engineering for military use. Skepticism of the BWC's deterrent value, as well as the utility of inspections, continued under the subsequent Bush administration. The U.S. intelligence community had clear indicators that Iraq, another BWC state party, had developed an offensive BW program. However, the administration was distressed that UNSCOM inspectors were unable to provide explicit, validating evidence. The Bush administration viewed defensive preparation and economic concerns as priorities over attempts at verification. This view led to its suppression of initial moves toward a verification protocol discussed at the 3rd Review Conference of the BWC.

The Clinton administration noted the limitations of the BWC as an effective means to pursue nonproliferation. In 1993 Clinton's Secretary of Defense, Les Aspin, unveiled the Counterproliferation Initiative. The basic goal of the program was to combat the problem where it existed rather than simply attempting to prevent the spread of BW programs. Under this program, counterproliferation became the purview of the Department of Defense. While the concept of counterproliferation was not an invention of the Clinton administration, the execution of the policy became decidedly more aggressive (Mahnken 1999, 93). Under this program President Clinton authorized the 1998 cruise missile strikes against a suspected BW production facility in Sudan and Operation Desert Fox against WMD sites in Iraq. The administration perceived the need for a more aggressive due to the continuing disclosures of former-Soviet and Russian violations. However, the Clinton administration's support for nonproliferation programs, including the BWC appeared less forceful. Allegedly, competing agendas within the government bureaucracies hindered a focused approach on the diplomatic front. Clinton oversaw the ratification of the CWC, but "attention toward the BWC was marginal [as] he never imposed his policy preferences on the substantial bureaucratic opposition in his own administration" (Leitenberg 2002). A general move away from strong support for strengthening the BWC is undoubtedly linked to the prevailing difficulties in this area. The 1990s brought continued discoveries of Iraqi and former-Soviet programs. For example, in 1998 the Russians announced that they moved smallpox samples to the Vector research facility four years earlier without notifying the WHO (Preston 2002, 106). The nature of the threat continued to transform. The Human Genome Project provided a wealth of potentially devastating information to proliferators.

President George W. Bush continued to follow a more aggressive path. The concept of "anticipatory self-defense" in the current NSS clearly demonstrated the administration's strengthening of its counterproliferation concepts. Additionally, the administration lessoned its reliance on international treaties and regimes, through its abandonment of several protocols. The current strategy calls for a mix of both nonproliferation and counterproliferation programs. The strategy lists the key tenants of the counterproliferation strategy as interdiction, deterrence, defense and mitigation. Under nonproliferation, the focus is upon nonproliferation diplomacy, multilateral regimes, nonproliferation and threat reduction cooperation, U.S. export controls, and nonproliferation sanctions. There are only two references that address the ability to identify any developing capability. The first is a statement that the U.S. must "enhance the capabilities of our military, intelligence, technical, and law enforcement communities to prevent the movement of WMD materials, technology, and expertise to hostile states and terrorist organizations" (Bush 2002b, 2). The second is that "our overall deterrent posture against WMD threats is reinforced by effective intelligence, surveillance, interdiction, and domestic law enforcement capabilities" (Bush 2002b, 3). While there is a reference to pursuing "constructive and realistic measures to strengthen the BWC," there is no reference to what those measures might be (Bush 2002b, 4).

Types of Verification

The BWC's draft verification protocol called for state parties to make annual declarations of any "facilities and activities that are particularly suited for offensive BW purposes" (Tucker 1998, 24). Given the dual-use capability of a great percentage of biologically related facilities such a vague definition presented serious problems. The text

of the draft protocol required state parties to declare all facilities that were involved in biological research, testing, and production that involve certain agents or exceeded certain thresholds. Examples of these restrictions include volume of testing chambers, amounts of growth medium, the existence of biological laboratories requiring high degrees of containment, and production of restricted pathogens such as anthrax, botulinum toxin, or plague. The treaty does not ban outright much of the equipment, biological organisms and genetic material that can be used for furthering an offensive BW program because of the dual-use aspect that pertains to most aspects of this field. The treaty allows parties to pursue defensive research, an inherent part of which includes research that shares many similarities with the work involved in offensive programs.

A state's declarations would be verified through the use of NCVs. The draft protocol defined NCVs as "on-site measures in the absence of suspicions of non-compliance" (Pearson 1997). The draft protocol called for two types of NCVs: random visits and focused visits. Random visits would consist of inspectors visiting a small sampling of a state's declared facility on an irregular basis. The other type of NCV would be the focused visit. The purpose of these inspections would be to clarify or resolve any discrepancies in a state's declarations. The draft protocol did not reference regular visits to declared facilities as contained in the CWC. The CWC terms these visits as "routine inspections". Under the draft protocol state parties had no right to refuse a NCV to a declared site or facility. A major point of contention among BWC delegates concerned the distribution plan for NCVs. The Swedish delegation recommended that random visits be limited to a total of fifty per year equally divided among the five geographical blocks. However the nonaligned members objected that such a quota system would be

"discriminatory," proposing instead that the number of random visits be explicitly linked to each state's declared facilities. The result of this plan, opposed by the U.S. and Japan, would impose the vast preponderance of random visits upon the more developed nations (Tucker 1998, 25).

The proposed text also referenced the concept of a challenge inspection. The purpose of this type of inspection would be to investigate alleged violations of the BWC. Any state party could call upon the BWC Executive Council to authorize such inspections to substantiate claims of BWC noncompliance. If a challenge inspection were approved, the alleged violator would receive no less than 108 hours notice of the impending inspection.

Both supporters and detractors of the proposed BWC verification protocol have cited UN-sponsored inspections regimes in Iraq to support their respective arguments. In fact this thesis examines the findings and experiences of the UNSCOM and UNMOVIC inspections. Such observations are useful in drawing some general conclusions regarding the effectiveness of inspections. However, it is important to highlight that the UN's inspection regime in Iraq is not the same as that outlined in the composite text presented at the 5th Review Conference.

The most obvious differences are that the UN-sponsored inspection regimes in Iraq were neither voluntary nor assisted. Following the Gulf War, Iraq initially declared that they had no BW program. They were not required to present a declaration list on the scale proposed at the 5th Review. Thus, there was no system of random visits to verify Iraqi claims. While UNSCOM did conduct follow-up focused visits based on subsequent Iraqi declarations, such visits were exceptional. The vast majority of UNSCOM's

inspections were based upon allegations of Iraqi noncompliance. This situation is precisely the opposite of that intended by the drafters of the verification protocol.

In a basic sense, the UNSCOM and UNMOVIC inspections of Iraq have a general similarity to the challenge inspections as called for in the composite text debated in the 5th Review. They were certainly intrusive, as inspectors searched for banned material in private residences, presidential palaces and military installations. The inspections were also based on allegations of BWC violations. Additionally, Iraq often refused to allow UNSCOM to conduct their inspections, actions that would be permitted under the draft protocol as a state's "right of refusal." However, while the composite text calls for a 108-hour advance notice prior to all such inspections, Iraq often had considerably more time to prepare. The example of UNMOVIC highlights this. UNMOVIC inspectors may have achieved a degree of tactical surprise in carrying out their inspections after December 2002. However, the UN ceded all manner of strategic surprise. As mentioned above, a year after the UNSCOM mission ended, the 1999 UN Security Council Resolution 1284 creating UNMOVIC alerted Iraq that they were not to be free from future inspections. In November 2001 Under Secretary of State Bolton announced to the 5th Review Conference that UNMOVIC was "prepared to resume on-site activities in Iraq" (Bolton 2001). The UN initiated formal discussions of reinstating Iraqi inspections in April 2002. However, the inspections did not resume until eight months later.

Assessment of Past Strategies

In his previously cited analysis, Milton Leitenberg stated that the number of states possessing a BW capability had increased almost 300 percent over the past thirty years. The FAS offered similar estimates of a consistently growing threat. The current

NSCWMD appears to accept the overall limitations of policy to prevent proliferation as it states: “We know from experience that we cannot always be successful in preventing and containing the proliferation of WMD to hostile states and terrorists” (Bush 2002b, 2). The experience in Iraq demonstrates the difficulties of determining the exact nature of an adversary’s BW program. Despite the many complications, the UNSCOM inspectors in Iraq unearthed a tremendous amount of evidence that indicate that Iraq had amassed a substantial BW program. As noted above, however, most of their discoveries were linked to Iraqi declarations following Hussein Kamel’s defection.

Additionally, there is some conflicting evidence concerning the effectiveness of the threat reduction cooperation programs the U.S. has pursued to prevent the exodus of bioresearchers from the Former Soviet Union. In 2000 the General Accounting Office submitted a report to Congress that assessed that programs sponsored by the Department of Defense Threat Reduction Agency had been successful in assisting Russia in transitioning the efforts of former-Soviet bioresearchers towards benevolent programs. Milton Leitenberg stated: “There has been minimal dispersion of researchers from the former-Soviet BW facilities to countries of concern” (Leitenberg 2000). However there is a body of evidence that supports a less optimistic appraisal of this situation. The U.S. effort must be compared to the scientists’ meager incomes ($67 per month in 1996) and to the generous incentives provided by foreign governments, such as Iran’s offer of $5000 per month for these experts’ services (Cameron 1996).

Reasons for Rejecting a Verification Regime

Effectiveness

Foremost of the U.S. objections to the verification protocol is that it would not be effective. The examples of inspections in the Soviet Union and Iraq are clear examples of the limitations of inspections. In both of these situations there were occasions when inspectors were in facilities virtually jam-packed with BW research, testing and production equipment; and in some cases weaponized BW agents. The inspectors, obstructed and deceived, usually suspected violations, but rarely discovered concrete evidence. Since 1991 the UNSCOM and UNMOVIC inspectors have scoured Iraq for hard evidence (the "smoking gun") of the BW program, to no avail. In the view of the administration, a verification regime would have little hope of detecting noncompliance and thus would be of negligible deterrent value.

Ambassador Donald Mahley, the lead U.S. BWC negotiator, noted that the "range of facilities potentially relevant to the [BWC] indicates that they number, at least in the case of the U.S. in the thousands, if not the tens of thousands." While the CWC lists precursor chemicals and activities that are clearly related to the production of chemical weapons, "no such cataloging is possible with respect to biological facilities [as] almost any facility that does biological work of any magnitude possesses the capability, under some parameters, of being diverted to biological weapons work" (Mahley 2001). The problem of accurately cataloging these facilities would be nearly insurmountable given the vagueness of the declaration requirements. According to ambassador Mahley, any state's list of declared facilities would be "almost randomly selected from among those actually relevant to a potential proliferators . . . [and] among that random sample of

facilities, regular on-site [inspection] activity would take place at only a random sample of even that sub-set" (Mahley 2001).

Further, when Congress mandated that the Clinton administration conduct mock inspections of several American biodefense facilities, vaccine production plants and academic laboratories in 1994 and 1996, the results were alarming. Under the vague restrictions of the BWC, the inspectors were easily able to cast suspicion on the wholly legitimate activities (Miller, Engelberg, and Broad 2001, 300). Seemingly, inspectors could not avoid identifying such "false positives" given the protocol's hazy language.

In another example, the pro-arms control Stimson Center conducted an equally troubling exercise. The organization deliberately laced a New York State laboratory with simulated anthrax cultures and planted suspicious documentation. They even went so far as to instruct the lab personnel to "act nervous". The center than had two experienced experts inspect the lab. These experts, with experience in inspecting suspected BW facilities in Iraq and Russia did not identify the pathogens, nor did they recognize the documentation (*Wall Street Journal* (New York), 27 July 2001).

Dr. Fred Ikle, former Deputy Secretary of Defense under President Reagan, stated further that proliferators would not bind themselves to adherence to the spirit of verification inspections. Citing the examples of previous UNSCOM experience, he stated, "when the United Nations presence in Iraq still had some muscle -- far more muscle indeed than this protocol would ever provide -- Saddam simply told the inspectors that his palaces and other sites were off limits. He suffered no penalty" (*Wall Street Journal* (New York), 27 July 2001). While some of these concerns were somewhat

remedied during the most recent UNMOVIC inspections, issues involving access would undoubtedly pose similar problems under BWC-sponsored inspections.

One of the primary weaknesses of the verification procedures outlined in the latest protocol centers around the requirement that states suspected of violating the treaty be provided advance notice of an upcoming challenge inspection. Accused states would be given 108 hours to prepare for challenge inspections. Clearly, such advance warning would seriously jeopardize the purpose of such inspections, as negative findings would be almost preordained. The experience of inspections in Russia and Iraq clearly demonstrate the difficulty of identifying noncompliance despite reliable intelligence contending otherwise. The U.S. position is not simply that a verification regime would not be effective, but that such a protocol would actually be dangerous in that it would generate a "false sense of security." The danger is that failure to identify noncompliance during verification inspections may lead the international community or the domestic population to incorrectly assume that a state is not pursuing an offensive BW program.

Risks to National Security

The U.S. has the largest biodefense program in the world. The need to acquire "cutting-edge technology that can quickly and effectively detect, analyze, facilitate interdiction of, defend against, defeat, and mitigate the consequences of WMD" is a component of the national strategy (Bush 2002b, 2). Additionally, the U.S. is on less than friendly terms with many of the countries it has asserted are pursuing BW programs. The U.S. has conducted military action against several since the BWC was initiated. Most of the countries believed to be pursuing BW programs are listed as states supporting terrorism. The U.S. has a significant stake in assuring the viability of its biodefense

programs. Allowing international inspectors to probe and analyze such programs certainly presents a degree of risk to national security.

Economic Costs

Upon his announcement of the U.S. rejection of the verification protocol, Ambassador cited U.S. concerns over the potential "loss of highly sensitive and highly valuable intellectual property from the U.S. pharmaceutical and biotechnology industries" (Kellerhals 2001). The economic stakes are very high. The PhRMA, a group representing the country's leading companies in these fields, reported that in 2001 the industry invested more than $30 billion in discovering and developing new medicines (PhRMA 2003). The biotechnology industry in the U.S. is comprised of over 1,400 companies employing over 179,000 people. The industry continues to grow at a rapid pace having more than tripled in size since 1992. Finally the U.S. biotechnology industry is heavily engaged in research and development, having spent $15.6 billion on new projects in 2001 (Biotechnology Industry Organization 2003). The DNA genome patent alone could be worth billions of dollars (*National Review (*New York), 27 June 2000). The industries can support their concerns over the risks of industrial espionage based on the past experience. On two separate occasions in 1992, the U.S. allowed a Russian team to inspect a facility owned by Pfizer. On the second such visit, a member of the Russian entourage was found roaming unsupervised through the facility (Miller, Engelberg, and Broad 2001, 170). This incident went far in cementing industry fears concerning the security of proprietary information.

It should not be a surprise that the U.S. has serious concerns that verification inspections may undermine an important sector of the American economy. As mentioned

above, the U.S. pharmaceutical industry employs thousands of people. The market capitalization of biotech companies was $224 billion in early 2002 (Biotechnology Industry Organization 2003). It is also not surprising that this issue is a greater concern to the U.S. than to other nations. Not only is the pharmaceutical industry in the U.S. the world's largest, but as of 1999 it was larger than the same industries next eight countries combined (IMS Health 2003).

Many have drawn parallels between the BWC and the CWC. The CWC's verification provisions, while initially opposed by the chemical lobby, were eventually accepted by the industry. However, there are significant differences. The economic stakes mentioned above are exponentially higher than the chemical industry's financial concerns. Additionally, the intellectual propriety concerns in the relatively young biotech community far outweigh those of the more established chemical industry. Chemical formulas are routinely published in the public domain, it is only the catalyst or production technique that is protected as confidential information. However, in the biotech arena, the confidential information is often the genetic information of living organisms that are the key agent for production or the final result of production. Finally, the disruption caused by verification inspections, and the overall risk to the industry is potentially much greater under the BWC than with the CWC. Under the requirements of the CWC the Department of Commerce has listed 138 sites and 640 plants that are involved in utilizing controlled chemicals listed in the CWC. The dual-use nature of virtually every aspect of the biotechnology sector greatly complicates this issue.

Burden to Research

The biological research community, given a voice by the ASM, has serious objections to the draft protocol, especially the concept of NCVs. Their specific stand on the issue is that "inspections to confirm compliance with the [BWC] should be conducted when there is adequate cause" (ASM 1993). David Huxsoll, former commander of the U.S. Army Medical Research Institute of Infectious Diseases asseted that in order to be effective the intrusiveness required of any verification inspections would place a tremendous burden upon researchers. Such a distraction and the risk of being suspected of participating in BW research may lead many aspiring legitimate researchers to employ their talents into other less potentially controversial areas of scientific research (Huxsoll 1993, 63-65). This would create a potential gap in a vitally important field of study. The U.S. has the largest and most advanced biological research facilities in the world. Because of this, most verification inspections would be focused on U.S. laboratories potentially creating "snowstorms of paperwork" on any equipment or research that could be put to use in BW production (*Wall Street Journal* (New York), 27 July 2001).

Legislative Viability

Ambassador Mahley in a 25 July 2001 speech to the Ad Hoc Group outlining the reasons for the U.S. rejection of the verification protocol expressed the very realistic approach that the U.S. delegation worked on the assumption that they would only support a protocol that would have a reasonable change of ratification. It made no sense to support an idealistic program that would only be rejected by the U.S. Senate. As a result of the issues raised above, Mahley assessed the draft protocol was "not one we could predict with reasonable probability the United States would become a party to. . . . This

is, in our view, a futile effort" (Mahley 2001). The delegation's view was that the protocol was flawed in a very basic sense, and no changes on the margins could mend it. The delegation undoubtedly remembered the difficulty in the CWC's ratification process. Certainly the firm opposition of the pharmaceutical industry would carry at least as much weight in the Senate, as the chemical industry lobby had during the CWC ratification. Mr. B. Alan Rosenberg, writing for the Carnegie Corporation, noted that the CWC likely would not have passed in the Senate had not the chemical industry supported the treaty in the end (Rosenberg, B.A. 2001).

Reasons for Pursuing a Verification Regime

Potential to Identify Proliferation

Few supporters of an inspection regime would claim that any type of inspections, even the most intrusive, could be totally effective in identifying BW threats. However, the UNSCOM inspections experience showed that inspections could bring about a certain degree of success. Though the inspectors rarely identified BW weapons or facilities through their own efforts, they were successful in verifying prohibited weapons and equipment identified through other means and overseeing or verifying the destruction of the same. Inspectors would not be effective acting on intelligence to discover violations during NCVs due to the random nature of these visits. However, challenge inspections offer the potential for verification inspectors to confirm specific allegations.

Deterrent Effect

The proposed verification protocol was not designed to identify 100% of BWC violations. Rather, the proposed system of declarations, NCVs and challenge inspections was designed to deter states from initiating or continuing to develop BW programs. By

this argument, a verification regime would support both nonproliferation and counterproliferation strategies. Proponents of the program claim that NCVs and challenge inspections compliment each other. In theory the prospect of NCVs would force aspiring proliferators to pursue clandestine programs outside of the established (and thus declared) biological research and production system. Purportedly, with no treaty right to refuse NCVs, the risk of discovery would be unacceptable. Clandestine programs would require "perfect secrecy" to prevent the risk of a challenge inspection. Any refusal to submit to a challenge inspection would bring considerable international pressure upon state in question. The combination of these "mutually supporting visitation provisions seek to create a synergistic force that presents only bad choices to a state wishing to produce biological weapons" (MacEachin 1998, 2).

However, this argument does not take into account the technical challenges of identification or the diplomatic realities of challenge inspections. MacEachin makes no mention of the failures of UN inspectors to identify evidence of Iraq's BW program despite a wealth of circumstantial evidence to the contrary. Additionally, the draft protocol only envisioned NCVs at a handful of facilities, a miniscule proportion of the thousands that the U.S. would have to declare. Finally, MacEachin views the challenge inspection as the fail-safe option. However, he makes no reference to the fact that no state has ever made use of such challenges under the CWC. There is no reason to believe that the situation would be different under the BWC. Thus it would appear that the deterrent value of a verification protocol is questionable, at best.

Protection of Intelligence Sources

Despite the clear limitations of inspection programs in Iraq, there were clearly advantages in their activities. The identification challenges posed by the unique nature of BW research, testing and production provide inspectors with an important potential niche in the intelligence collection process. Inspectors had the capability to verify intelligence provided by other means. Even the missed opportunities in the first years of the UNSCOM experience demonstrate that the potential for verification existed. The U.S. dominance in the technical intelligence fields does not fare well in effectively identifying the BW threat. Human intelligence gleaned from agents and defectors, is particularly useful in determining the existence of a BW program that may be hidden within apparently legitimate research enterprises (Miller, Engelberg, and Broad 2001, 80). However, the U.S. weakness in this field is well documented and "must be vastly improved" in order to effectively identify clandestine BW programs (Miller, Engelberg, and Broad, D. 1998). Because of their vulnerability to discovery, the U.S. must protect its HUMINT sources. Allowing inspectors to act upon HUMINT provided information could protect the sources from detection. Additionally, information reported by impartial inspectors would be more acceptable to the international community than that solely provided by an agent.

International Consensus

The U.S. has come under increasing pressure from the international community for its perceived unwillingness to submit to several multilateral regimes. As the lone dissenter to accepting the BWC's proposed verification protocol, the U.S. became the target of considerable criticism. In a reply to a statement by Under Secretary Bolton that

Iran was pursing an offensive BW program, Iranian delegate Ali-Ashgar Soltanieh accused the U.S. of pursuing a policy of unilateralism, stating: “The United States was not in favor of multilateralism and was to blame for the failure of the [proposed verification protocol], and the unfortunate fate of the Comprehensive Nuclear Test Ban Treaty, the Anti-Ballistic Missiles Treaty and the Kyoto Protocol” (Ali-Ashgar Soltanieh 2002). Such criticism coming from a longtime U.S. adversary is not surprising. However, similar complaints that the U.S. is out of step with the rest of the world have come from other voices. The FAS noted that the U.S. actions puts the nation in a “position more extreme than those countries on the radical fringe which have expressed significant objections to but not outright rejection of the text [allowing them] to use the United States as a shield for their views (Rosenberg, B.H. 2001a, 6).

There have also been allegations that the U.S. rejected the verification protocol in order to prevent the potential discovery of U.S. violations of the BWC. The U.S. had participated in programs that certainly tested the limits of the BWC. Two U.S. programs were highly controversial, especially due to the secrecy that surrounded them. From 1997 to 2000, the CIA conducted tests, code-named Clear Vision to build and test a model of a Soviet-designed “germ bomb.” While the debate raged in Geneva over the verification protocol, the Defense Intelligence Agency was overseeing Project Jefferson that strove to replicate Russian claims at bioengineering a more virulent form of anthrax (*New York Times*, 04 September 2001). The U.S. claimed that these programs were for defensive purposes, allowable under the BWC. However, the size of the U.S. programs made some skeptical to the U.S. assertion. For Project Jefferson the Defense Intelligence Agency constructed test chambers of 75 and 155 cubic meters in size (Leitenberg 2002). For

comparison, current export controls restrict aerosol test chambers to 1 cubic meter and the draft protocol would have limited defensive testing chambers to 5 cubic meters. There can little doubt that the U.S. would object to similar programs conducted by other states. During opening remarks to the 5th Review Conference, Elisa Harris, the National Security Council director for chemical and biological weapons issues, stressed the importance of strengthening the BWC. She warned that the failure to agree upon procedures to address BW problem would "send a very bad signal to proliferators that the international community lacks the will to enforce compliance with this agreement" (Leitenberg 2002). Ironically, the final U.S. position may well be sending that message.

Cost-Benefit Analysis

The positive and negative aspects of a verification program cannot be viewed in a vacuum. Verification inspections will affect the U.S. in a number of ways, not all of which are readily apparent. It is worthwhile to examine how verification will affect the different instruments of national power: diplomatic, informational, military and economic. These categories are not prioritized. Each represents in equally important factor of the U.S. overall strategy. Table 1 at the end of this section summarizes the following cost-benefit analysis.

Diplomatic

The U.S. rejection of the verification protocol has made it the focus of international disapproval. As the only holdout of 147 state parties, such censure could hardly have come as a surprise. The U.S. allies made a number of concessions in order to obtain U.S. support. The U.S. refusal to compromise placed many friendly governments in a difficult position. U.S. actions in regard to several other high profile international

negations such as the Kyoto Protocol, the, International Criminal Court, and the ABM Treaty have left many in the international community with the perception that the U.S. has a tendency to pursue a policy of unilateralism.

This perception must be weighed against the real concerns regarding the likelihood of ratification. The CWC's ratification process was difficult, and it was largely the acquiescence of the chemical industry that in the end allowed its passage. However, the pharmaceutical industry has much more to lose and as a result its objections have been much more strident. Given the current composition of the Senate, ratification of the verification protocol in its proposed form would be far from assured.

Informational

The verification protocol offers potential to protect the sources and methods of other U.S. intelligence collection capabilities. This is especially important given the U.S. weakness in the HUMINT field and the limitations of technical systems in identifying evidence of BW programs. Verification inspectors could impartially provide evidence of BWC violations to the international community.

However, these factors must be balanced against the limitations of inspections. The UNSCOM and UNMOVIC experiences in Iraq demonstrate that inspectors are vulnerable to obstruction and deception. The U.S. has expressed concern that negative findings could lead to a false sense of security regarding a potential threat. This was initially the case relating to both the Soviet and Iraqi programs. Many of the strongest advocates of the BWC in general, and a verification program in particular have been among those who have underestimated the Soviet and Iraqi programs in the past. Doctors Meselson and Lederberg, along with former Deputy Director of Intelligence, Douglas

MacEachin, and Milton Leitenberg were vocal critics of U.S. assessments that the Soviets were pursuing an aggressive BW program.

Military

The U.S. has invested a great deal of time, money and resources into developing an effective biodefense capability. While such projects as Clear Vision and Project Jefferson have certainly raised concerns regarding U.S. compliance to the BWC, these programs clearly have useful defensive utilities. Any defensive program will inherently require a certain degree of offensive research in order to replicate a known or potential threat. Verification inspections, especially NCVs, would potentially put the U.S. biodefense programs at risk of compromise. Additionally such inspections may, as some have observed, have a detrimental effect on research in the biotechnology field.

These concerns need to be weighed against the potential for the verification process to provide an additional means to identify potential threats. The experience of past inspections suggests that verification inspections have not been able to achieve a reliable level of discovery. Challenge inspections hold the promise of a certain degree of reliability of actual discover of BWC violations. However, most proponents of NCVs acknowledge visits to declared sites would not be very effective in identifying evidence of noncompliance as their function is more designed to "impede a potential violator's ability to mask signs of a prohibited weapons program behind the cover of legitimate activities" (MacEachin 1998, 1).

Economic

As outlined above, the issue of verification has potentially significant economic considerations that cannot be separated from a narrow view of national security. Other

states nominally have similar concerns over the effect verification may have on their own pharmaceutical industries. However, the overwhelming U.S. dominance in this field clearly puts U.S. interests at greater risks.

The concept of NCVs would likely force a greater share of offensive BW development to move to more clandestine channels. There would probably be a higher associated cost in running such an operation. However, these costs would pale in comparison to the massive expenditures by the biotechnological industry.

Table 1

Summary of Cost-Benefit Analysis

Instrument of Power	Advantages of supporting a verification protocol	Disadvantages of supporting verification protocol
Diplomatic	• Counters perception of U.S unilateralism • Potential deterrent to proliferation	• Undermines U.S. position that a "flawed" treaty is acceptable
Informational	• Allows protection of intelligence sources • Additional method of intelligence collection to augment HUMINT weaknesses • Obstructionist tactics could be exposed in international arena	• Potential interference with academic research • Negative findings provide false sense of security
Military		• Potential compromise of Biodefense programs
Economic	• Potentially increases the costs of proliferation	• Potential loss of proprietary information in a multibillion dollar industry

Alternatives

The U.S. has proposed a series of "alternative measures" to strengthen the BWC without the unacceptable degree of risk it asserted was embodied in the composite text of

the 5th Review. Undersecretary Bolton presented these measures to the BWC delegates shortly after announcing the U.S. rejection of the draft protocol. The U.S. has argued that these proposals would purportedly strengthen four existing articles of the BWC.

National Implementation

The first proposal refers to Article IV of the BWC that encourages state parties to adopt national legislation criminalizing violations of the BWC. The U.S. called for altering the language of the treaty to require state parties to adopt such laws, as the U.S. has already done. The U.S. proposal also called for "sensitizing scientists to the risks of genetic engineering" (Bolton 2001).

While both of these proposals are reasonable and may help build member confidence, they do little to strengthen the Convention in real terms. The rational observer would not accept that a state that is violating the terms of the BWC would prosecute its scientists for carrying out such activities. Additionally, the concept of "sensitizing scientists" to the consequences of their activities is almost laughable. The scientists are highly educated individual who are undoubtedly well aware of what they are doing. Certainly the Soviet scientists were cognizant of the consequences of their actions. Ken Alibek attending the briefing in which Soviet researcher reported successfully created the first hybrid biological agent. He stated, "The room was absolutely silent. We all recognized the implication of what the scientist had achieved" (Alibek 1999, 167). The U.S. has already adopted such a measure as the ASM's Code of Ethics states: "Microbiologists . . . will discourage any use of microbiology contrary to the welfare of human kind" (ASM 1993). Such a code has no real effect in enforcing or

restricting behavior. Neither will these proposals meet the requirements stated in U.S. strategy of identifying development or proliferation of WMD.

Assistance to Victims and Technical and Scientific Cooperation

These proposals cover two articles of the BWC, Articles VII and X, respectively. The U.S. recommended that state parties improve cooperation with the WHO in order to quickly identify outbreaks of suspicious diseases that may indicate the presence of the BW program. Additionally, the U.S. proposal called for state parties to adopt strict adherence to biosafety procedures and restricting access to certain biological material. Although Bolton did not go into detail on substance of such restrictions, one would presume that the U.S. proposals would make it more difficult for scientists to obtain potentially dangerous pathogens or sensitive genetic material. Such restrictions will surely meet objections from the scientific community as hampering legitimate research. While enhancing WHO's disease surveillance capability could potentially have a real effect, such a proposal relies heavily on cooperation from a proliferating state, or at least on the inability of such a state from covering-up any such incident, as the Soviets did with the anthrax outbreak in Sverdlovsk.

Consultation and Cooperation

This proposal refers to Article V of the BWC and most closely approaches a verification regime. The U.S. proposal called for a "mechanism for international investigations of suspicious disease outbreaks and/or alleged BW incidents" (Bolton 2001). Bolton did not define what would comprise a "BW incident" but rather leaves the determination to the UN Secretary General. The U.S. proposal supported establishing voluntary cooperative procedures for clarifying and settling compliance issues. It also

supports less intrusive measures such as voluntary visits, such as the "familiarization visits" championed by PhRMA (PhRMA 1998). This proposal has similarities to the challenge inspection concept of the proposed protocol of the 5th Review. Bolton asserted that this procedure would make investigations more relevant, as they would be linked to an alleged violation, rather than providing for random (and, in the U.S. view, ineffective) inspections. Additionally, Bolton stated that investigations under this proposal would be timely (Bolton 2001). Presumably, Bolton believed that these procedures would allow investigation to occur sooner than the 108 hours provided for challenge inspections under the 5th Review draft protocol. However, Bolton may have placed too much confidence in the decisiveness of the UN system. It should be remembered that the decision to send UNMOVIC to Iraq took a matter of months rather than days. It could be argued that the process has taken years, as UNMOVIC was established in 1999 and did not initiate inspections until December 2002.

The U.S. proposals will likely not meet the intent of the international community. Not having the same economic or national security concerns as the U.S., the other state parties have shown a willingness to support real strengthening of the BWC through a system of intrusive and random verification inspections. The U.S. proposals do not provide that same degree of deterrent effect or confidence of proactively identifying any violations. The U.S. proposals do not reflect a compromise solution, as the U.S. will not have to accept any concrete policy change. Forcing the international community to concede their vision for a stronger plan with no sacrifice on the part of the U.S. is likely to meet with strong international objections. The following chapter will address a possible compromise solution that will allow BWC strengthening effort to go forward.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The previous chapter examined a number of factors in order to answer the primary research question of whether a verification program would be an effective component of the U.S. BW nonproliferation strategy. It is clear that the BW threat exists and is continuing to become increasingly dangerous. U.S. strategy in the past has not been successful in combating the threat where it exists or preventing states from developing new BW capabilities. The BWC's draft verification protocol offers some potential for increasing treaty compliance, but in some cases the associated costs (in more than monetary terms) could be prohibitive. The proposed U.S. alternatives alone neither ensure a significant increase in BWC compliance nor are they likely to satisfy the international community. The U.S. is likely to have to review its decision to reject the proposed verification protocol. Such a review could identify that certain aspects of the protocol, especially challenge inspections, are acceptable to U.S. business interests and do not unduly place national security at risk.

The Threat

It is critical to first define the nature of the environment in order to highlight the relevance of the question. The analysis historical examples, threat models and the current state of proliferation demonstrate several things. History has shown that states have effectively established robust BW programs, and in the case of the former Soviet Union and Iraq, these states have do so in absolute disregard of the requirements of the BWC. The various models suggest that the effects of BW attack in the modern, globalized world

could have calamitous consequences. A review of the states that have developed BW capability in the years following the BWC shows that the BWC itself, as well as other nonproliferation efforts, have had only limited success in deterring states from pursuing BW programs. These factors demonstrate a need for the U.S. to review other options in order to stem the tide of proliferation.

Previous Strategy

The previous chapter then evaluates preceding administrations' strategies to combat the threat. Prior administrations have pursued a combination of nonproliferation and counterproliferation programs ranging from initial advocacy for the BWC to threat reduction programs following the fall of the Soviet Union to more aggressive counterproliferation policies espoused by past two administrations. The last fifteen years have witnessed the mixed results of international inspection programs carried out by UNSCOM and UNMOVIC. The lessons learned from these experiences are that diplomatic efforts alone have not been effective at limiting the spread or development of BW weapons. UN-sponsored verification programs have been generally ineffective at identifying proof of BW development. In fact, it is a matter of debate that these UN inspection programs have even been effective at deterring Iraq even while the inspection regimes were ongoing. Lack of success could be attributed in large part to technological innovations (such as mobile labs, advances in weaponization techniques, and improvements in bioengineering) that have created significant challenges to inspectors.

Types of Inspections

Chapter four also reviewed the different kinds of verification inspections. The UN-sponsored inspections in Iraq share some similarities with challenge inspections, but

on the whole are significantly different from the concept proposed at the 5th Review Conference. One significant difference is the intrusiveness factor. UN Security Council Resolution 1441 demanded that Iraq provide inspectors with “active cooperation and unfettered access”. Theoretically, UN-sanctioned inspectors expect unhindered and immediate access in the performance of their duties, although the realities of the situation often dictated otherwise. However, the challenge inspections proposed in the verification protocol would provide a 108-hour advance warning to the state in question. Additionally, the challenged state would have a right to refuse such inspections. Although UN inspectors in Iraq often experienced obstruction and downright refusals, such conditions were violations the requirements of UN resolutions.

The concept of challenge inspections supported by the pharmaceutical industry and the research community. The support of these groups is critical to the ratification of any verification protocol in the U.S. Senate. This position represents an important compromise as these groups have joined FAS in accepting the necessity of some sort of verification regime, despite the risks that unfounded allegations could pose to their reputations and proprietary rights (FAS 2000b).

The U.S. concerns with NCVs are considerably more significant. There has been no historical experience upon which to judge the effectiveness of such inspections in regard BW programs. While such inspections have been an important component of the CWC, the previous chapter highlighted the substantial differences between the chemical and biotechnological industries and the impact of the two treaties. Any comparison between the CWC and the proposed verification protocol of the BWC must consider the U.S. biotechnology industry’s unique factors.

Current Strategic Setting

The current strategy of anticipatory self-defense made a dramatic move from diplomatically driven nonproliferation programs to an increasingly military oriented counterproliferation focus. The future U.S. strategy must balance the need for an aggressive counterproliferation effort with a solid basis of international support for such programs. However, the U.S. abandonment of the 5th Review Conference protocol along with a perception of U.S. unilateralism has undermined international support for the U.S. counterproliferation strategy. The U.S. will need to include the international community to support counterproliferation strategy in order to avoid isolation.

The U.S. alternative to the proposed verification protocol was to support a modified inspection regime. The U.S. proposal appears much more akin to the UN-sponsored inspection regimes. The reason for this is diplomatic. The Defense Threat Reduction Agency has reported that as of January 2003, no challenge inspections have been conducted under the auspices of the CWC since its inception (Defense Threat Reduction Agency 2003). Experience has shown that the likelihood of inspections discovering evidence of treaty noncompliance has been quite low. However, the diplomatic fallout resulting from an "unfounded" public accusation would be significant. Thus, the U.S. is more comfortable with a generally ineffective UN-mandated systematic inspection campaign rather than a politically risky one-time challenge.

The concept of NCVs does not support the counterproliferation strategy. These types of inspections do support nonproliferation in the area of chemical weapons development because the chemical weapons development is inherently easier to isolate and identify. Unlike the BW arena, chemical warfare development and production

involves well-established technology, well-known precursors, and a significantly limited dual-use potential. Additionally, the scale of the biotechnology industrial complex and the exponential advances in genetic engineering put the industry at immeasurably greater economic risk. This risk cannot be viewed in isolation from the overall U.S. National Security Strategy. The lack of effectiveness of NCVs as a deterrent taken with the potential associated costs to industry and academic research make this type of unsuitable as a component of U.S. strategy.

Compromise

As stated above, the U.W. proffered a number of alternatives to the proposed verification regime. Of these, the "Consultation and Cooperation" that called for UN-sponsored investigations is the most relevant to a discussion of verification inspections. However, this proposal does not reflect much of a compromise. It represents only a formal adoption of the *status quo*. The U.S. plan generally disregarded the positions endorsed by virtually the rest of the world. The U.S. could support this additional measure that offers a more reasonable degree of effectiveness, along with the generally approved concept of challenge inspections. This compromise might satisfy international community that the U.S. is willing to go forward to strengthen the BWC, while allowing the U.S. to back off of the truly problematic issue of NCVs. As with the CWC, it is unlikely that states would rarely, if ever, use challenge inspections. However, such a provision has a measure of control to protect against frivolous accusations and is acceptable to U.S. business and academic interests. Challenge inspections could be used in the event that the U.S. had absolute evidence of noncompliance that could not reasonably be hidden by the suspected offender. UN inspections would be more

appropriate against states the U.S. suspected of pursuing a robust and systematic state-sponsored program. Such a compromise would promise support from the international community that is absolutely necessary to pursue either challenge inspections or UN-sponsored type inspections.

A well thought out verification protocol has the potential to be a useful component of the U.S. counterproliferation strategy. Verification inspections promise a degree of legitimacy that can only come about from a multilateral regime. However, as with all other identification methods, verification has its limitations. Verification will never be the "silver bullet" to defeat BW proliferation. The U.S. should be careful not to degrade other methods in order to support verification. A case in point has been the call for the U.S. to share intelligence in order to support the UNMOVIC inspections in Iraq. The U.S. counterproliferation strategy depends on the ability to both identify and potentially attack WMD targets. Sharing information with inspectors risks the compromise of that information, along with the sources and methods, and could potentially undermine the U.S. ability to destroy these targets (Halbert 2002). Such requirements to maintain a degree of operational security are prudent policy. These considerations ensure that verification will never reach its full potential for effectiveness. As such verification must not become a critical link. The U.S. must also focus on alternative capabilities to augment the identification process in order to give the U.S. a full complement of tools to combat the unique challenges of BW proliferation. However, an internationally supported inspection regime that does not put U.S. interests at risk would be an important pillar of the U.S. counterproliferation strategy. The international community has spoken that they believe the BWC and a corresponding verification

regime to be vital to combating the increasing BW threat. The U.S. should not take international opinion for granted in the pursuit of more aggressive methods lest it find itself combating the threat alone.

Subject for Future Study

This thesis did not examine the impact of a verification protocol on non-state actors, such as Hamas or al-Qaida. Any diplomatically driven program will surely have limitations in influencing such groups. However, these organizations often receive a degree of support from states. Any effect that a verification regime could have on a state could have an associated effect on groups affiliated with that state. There has been little analysis on this aspect of verification. Due to the increasing aggressiveness of such groups, this is a topic worthy of further research.

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