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Search, Sentence, and (Don't) Sell: Combating the Threat of Biological Weapons Through Inspections, Criminalization, and Restrictions on Equipment

Timothy K. Gilman

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J.D. candidate, Georgetown University Law Center (May, 2003); M.P.H. candidate, Johns Hopkins School of Public Health (May, 2003); A.B. Chemistry, Princeton University (1998).

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SEARCH, SENTENCE, AND (DON'T) SELL: COMBATING THE THREAT OF BIOLOGICAL WEAPONS THROUGH INSPECTIONS, CRIMINALIZATION, AND RESTRICTIONS ON EQUIPMENT

TIMOTHY K. GILMAN*

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I. INTRODUCTION

Biological weapons represent a significant threat to the security and health of the United States and the rest of the world. Naturally occurring biological agents, such as smallpox, have been responsible for hundreds of millions of deaths over the last century. Advances in biotechnology have created the potential to make these agents even more dangerous. The potential damage from a large-scale attack using sophisticated bioweapons is incalculable.

In 1972, the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction ("Biological Weapons Convention" or "BWC") was formed to combat the threat of

* J.D. candidate, Georgetown University Law Center (May, 2003); M.P.H. candidate, Johns Hopkins School of Public Health (May, 2003); A.B. Chemistry, Princeton University (1998). The author would like to express his sincere gratitude to Professor John Podesta, who advised him on this article.

bioweapons.[1] Although many states have ratified the agreement, the BWC has done little to combat the development of bioweapons by state and non-state actors. This failure has been largely attributed to the lack of an adequate enforcement mechanism for the BWC.

Three types of solutions have been proposed to this lack of enforcement mechanism: inspection regimes; equipment restrictions; and criminalization. Inspection regimes would force both public and private facilities to submit to declaration requirements and inspections of their capabilities in addition to their potential involvement with bioweapons. Equipment restrictions would attempt to combat the risk by limiting access either to the microorganisms themselves or to the sophisticated equipment needed to develop and weaponize the agents. Criminalization would attempt to target those actors who are developing bioweapons, either through domestic legislation or international recognition of bioweapons as a universal crime.

Three proposals have been advanced which incorporate various aspects of these solutions. The BWC Ad Hoc Group ("BWC proposal") has advocated an inspection regime modeled on the Chemical Weapons Convention ("CWC") and has also recognized the potential value of criminalization. The Bush administration, after rejecting the BWC inspection proposal, has advocated domestic criminalization by all members of the BWC and equipment restrictions. And, the Harvard Sussex Program has advocated universal criminalization of bioweapons.

Each of the proposals has advantages and drawbacks. The BWC proposal would be the best at reaching state actors, but its potential efficacy is questionable and concerns have been raised regarding national security and threats to proprietary information during inspections. The Bush proposal is designed to address the threat of non-state actors, but its criminalization approach has proved largely ineffectual in the United States where its restriction on equipment has proved difficult to implement. The criminalization of the Harvard Sussex approach would be more effective than the Bush administration's criminalization, but it would likewise fail to reach state actors.

In order to create an effective tool for combating bioweapons, elements from all three proposals would be needed. The various threats that both state and non-state actors pose must be addressed

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1. Convention on the Prohibition of the Development, Production and Stockpiling of Biological and Toxin Weapons and on their Destruction, *opened for signature* Apr. 10, 1972, 26 U.S.T. 583 (*entered in force* Mar. 26, 1975), *available at* http://disarmament.un.org/TreatyStatus.nsf (last visited Feb. 17, 2003).

through effective mechanisms. While no approach would be completely successful, any substantial reduction in the threat and proliferation of bioweapons would be of immense benefit to the United States and the rest of the world.

II. THREAT ASSESSMENT

"'[T]he tragedy of September 11 was nothing like what might be possible with biological weaponry.'"

- Bill Joy, Chief Scientist of Sun Microsystems, on the potential of biotechnology to develop devastating weaponry.[2]

In determining the best response to the threat of bioweapons, it is important to initially establish what actual threat is posed. First, this section will identify the potential agents and their relevant characteristics that would be used. Second, this section will analyze the historic uses of bioweapons by states and non-state groups to determine the type of actor, the associated type of agent and the kinds of uses. Third, this section will evaluate the current types of actors and the threats that they represent. Finally, this section will conclude with an overall assessment of the risk created by bioweapons from both state and non-state actors.

A. Types of Agents

Although there are literally thousands of potential biological agents that might be used,[3] a number of specific organisms have been identified as important in considering the large probability that they would be used, or the risk of extreme harm that could result, if they were used. Although anthrax has attracted the most recent publicity,[4] a recent symposium of scientists and public health professionals have also identified smallpox, plague, and botulinum toxin as potential threats.[5] These agents also appear as the most dangerous threats on the critical agents list of the Center for

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2. *Bioweapons: A Potential Threat of Mass Destruction*, THE HINDU, Oct. 31, 2001 [hereinafter Bioweapons], *available at* 2001 WL 28477849.

3. *US Representative Christopher Shays Holds Hearing on Biological Terrorism*, FDCH POL. TRANSCRIPTS, Oct. 12, 2001 [hereinafter *Hearings*] (testimony of Ken Alibek, a.k.a. Kanatjan Alibekov, former deputy head of Biopreparat, the Soviet Union's bioweapons program, and President of Advanced Biosystems, Inc.), *available at* 2001 WL 26187096.

4. *See, e.g., Anthrax Investigation—Award Increased*, Press Release, FBI, (Jan. 23, 2002) [hereinafter FBI], *available at* http://newark.fbi.gov/pressrel/2002/pr012302.htm (offering reward of up to $2.5 million for information on recent anthrax attacks).

5. David H. Frankel, *US Experts Take the Threat of Bioterrorism Seriously*, THE LANCET, Feb. 27, 1999, *at* 734.

Disease Control ("CDC"), as well as hemorrhagic fevers such as Ebola and Marburg.[6]

These potential agents can be divided in three categories. The first group includes common agents, which are organisms that are relatively ubiquitous in the environment and can be cultured and stored with relative ease. The second group includes exotic agents, which include extremely rare, or difficult to culture, agents and to create weaponized forms of common agents. And the third group includes smallpox, which is treated separately due to its extreme rarity and enormous potential for inflicting human casualties even in an unweaponzied form.

1. Common Agents

Common agents include bacteria, such as anthrax and plague, and biotoxins, such as botulinum toxin and ricin. These agents are relatively common in nature and relatively easy to culture as compared to other possible agents. While these agents can be extremely lethal, they are not likely to cause widespread harm due to the lack of person-to-person transmission, the availability of treatments, and the difficultly in delivery. Examples include:

> *Anthrax*: Anthrax, or *Bacillus anthracis*, is a ubiquitous bacterium found throughout the world.[7] Although more common in temperate climates, it is also found in the United States.[8] The bacterium is fairly easy to culture, but would not grow well in quantity without sophisticated fermenter equipment.[9] Although the spore form of the bacteria is highly stable in the environment, its physical properties

6. Ali S. Khan et al., *Public-health Preparedness for Biological Terrorism in the USA*, THE LANCET, Sept. 30, 2000, *at* 1179. The Pan American Health Organization also lists anthrax, smallpox, plague, botulism, and hemorrhagic fever viruses as likely bioweapon agents. Pan American Health Organization, *Intentional Use of Biological and Chemical Agents: Risks and Recommendations*, *at* http://www.paho.org/English/SHA/be_v22n3-bioterrorism.htm (Sept. 2001) (on file with author).

7. The disease generally preys upon grazing animals such as sheep and goats. David Tell, *All About Anthrax; Everything You Didn't Want to Know*, WKLY. STANDARD, Oct. 29, 2001, at 29 (describing historical and current incidents of anthrax); Barry Kellman, *Biological Terrorism: Legal Measures for Preventing Catastrophe*, 24 HARV. J.L. & PUB. POL'Y 417, 433-34 (2001) [hereinafter Kellman, *Biological Terrorism*] (detailing key features of anthrax and other agents). For a general description of anthrax, see *CDC Fact Sheet on Anthrax, available at* http://www. cdc.gov/ncidod/dbmd/ diseaseinfo/anthrax_t.htm (last visited Dec. 13, 2002).

8. In the early twentieth century, there were over 100 human cases of the disease reported each year in the United States. Tell, *supra* note 7, at 29.

9. Kellman, *Biological Terrorism*, *supra* note 7, at 459.

make it difficult to aerosolize.[10] Anthrax is also not contagious from infected individuals.[11] Inhalation anthrax infections are almost always fatal if not treated before the onset of symptoms.[12]

Plague: The plague, or *Yersinia pestis*, is infamous for wiping out one-quarter of Europe's population during the Middle Ages.[13] Like anthrax, it is found naturally in animal populations worldwide and within the United States.[14] There are generally ten to fifteen documented cases of plague in the United States each year, and an estimated 1,000 to 3,000 worldwide.[15] It is highly communicable person-to-person, but somewhat difficult to grow in culture.[16]

Botulinum Toxin: Botulism, or *Clostridium botulinum* toxin, is different from the above agents in that it is a biochemical compound rather than a reproducing organism.[17] It is extremely toxic;[18] however, it is difficult to deliver to large populations, and would not reproduce like other agents.[19]

Ricin: Also a potent biotoxin, ricin can easily be isolated from castor beans.[20] It is extremely toxic through dermal exposure, and has been used mainly

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10. *See* Pan American Health Organization, *supra* note 6 (evaluating biological agents that might be used as weapons); Kellman, *Biological Terrorism*, *supra* note 7, at 458 (same); Rick Weiss & David Eggen, *Additive Made Spores Deadlier*, WASH. POST, Oct. 25, 2001, at A01 (stating that only the United States, Russia, and Iraq have the capability of producing the weaponized form of anthrax used in recent attacks).

11. Meryl Nass, *Biological Warfare*, THE LANCET, Aug. 9, 1998, at 491 (analyzing key features of anthrax).

12. *Fact Sheet on Anthrax, supra* note 7. There are natural and engineered strains of anthrax that are resistant to antibiotics. Nass, *supra* note 11, at 492.

13. Scott Keefer, *International Control of Biological Weapons*, 6 ILSA J. INT'L & COMP. L. 107, 113 (1999).

14. Kellman, *Biological Terrorism*, *supra* note 7, at 434-35.

15. CDC, *Plague Home Page*, *at* http://www.cdc.gov/ncidod/dvbid/plague/index.htm (last visited Jan. 23, 2002).

16. Kellman, *Biological Terrorism*, *supra* note 7, at 435.

17. Botulinum toxin is the only non-replicating agent in the top six biological agents that are threats to civilians. Robert Schechter & Stephen Arnon, *Extreme Potency of Botulinum Toxin*, THE LANCET, Jan. 15, 2000, at 238.

18. The LD_{50}, or dose needed to kill 50% of animals in laboratory testing, is 0.4 ng/kg. Extrapolating from this data, one ounce, if evenly distributed, could kill over one million people. *Id.*

19. *See id.*

20. Kellman, *Biological Terrorism*, *supra* note 7, at 436.

in assassination attempts, such as by coating the tip of an umbrella and making contact with exposed skin.[21] Similar to botulinum toxin, it is difficult to deliver to large populations, and would not reproduce once delivered.

Because of their availability, common agents represent the most likely agent to be used in a bioweapons attack. They are fairly easy to acquire and produce, but are difficult to deliver as part of a widespread attack. They may also be useful in attacking individuals or small groups but are not suited to causing widespread harm. Apart from the psychological response these weapons may elicit in the public, they are far less effective and more expensive than conventional weapons.[22]

2. Exotic Agents

Exotic agents are much more difficult to acquire and develop than common agents because they can be relatively rare, difficult to culture, and require sophisticated equipment and expertise. This category includes some viral agents, such as the hemorrhagic fevers and weaponized forms of other agents. Examples include:

Hemorrhagic Fevers: Viruses such as Ebola and Marburg can be highly infectious and fatal.[23] They have the potential to spread within a population after an initial attack and cause widespread harm. However, they are very rare in the environment and can be found only in limited geographical areas during outbreaks.[24] These viruses are also difficult to culture and would be difficult to deliver in an initial attack.

Weaponized Common Agents: Sophisticated engineering may be able to reduce the limitations of the common agents described above. Possible modifications include mechanical engineering to

21. *Id.* at 442.

22. *See Hearings*, *supra* note 3 (testimony of Raymond Decker, director of the Defense Capabilities Management Team for the United States General Accounting Office).

23. *See* Kellman, *Biological Terrorism*, *supra* note 7, at 435-36 (describing the characteristics of these agents).

24. *See* CDC, *Viral Hemorrhagic Fevers: Fact Sheet*, *available at* http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/vhf.htm (last visited Jan. 23, 2002).

improve the delivery of these agents[25] and bioengineering to improve the innate characteristics or to develop resistance to medical treatments.

Bioengineered Agents: New agents may continue to emerge as potential threats. In January 2001, Australian scientists reported that they had accidentally created a virulent strain of mousepox.[26] As biotechnology continues to evolve, more sophisticated biotoxins, such as interference RNA, may emerge as novel bioweapons.[27] Although any threat from such designed bioweapons would not likely materialize in the near future, it may be important to keep such sophisticated weaponry from being developed.

Exotic agents represent a more serious threat than common agents. These agents could be highly infectious and spread quickly through a population. For many of these agents there are no effective treatments. An attack using such weapons could affect a far larger population and cause greater damage than an attack using common agents. However, they are more difficult to acquire, culture, and use, and they may require significant facilities to develop. Therefore, it is likely that only sophisticated actors with significant resources would have access to exotic agents.

3. Smallpox

Smallpox, or *Variola major*, is included in a separate category because of its unique characteristics. It is similar to common agents in that it is easy to culture.[28] Because it is highly contagious,[29] even

25. *See Hearings*, *supra* note 3 (testimony of Dr. Kenneth Alibek, former deputy head of Biopreparat, the Soviet Union's bioweapons program, and President of Advanced Biosystems, Inc.).

26. Richard Ingham, *Miracle of Biotech Could Also Breed a Monster*, AGENCE FR. PRESSE, Oct. 23, 2001.

27. RNAi could be designed to inactivate a specific gene within a host. *Bioweapons*, *supra* note 2.

28. *60 Minutes: Smallpox* (CBS television broadcast, Oct. 1, 2000) (Mike Wallace reporting), *available at* 2000 WL 4212977 [hereinafter *60 Minutes*] (noting that it is possible to produce substantial quantities of smallpox by simply inoculating a chicken egg with the virus and then harvesting a week later).

29. In some outbreaks, infected individuals have each infected over ten other people. Donald A. Henderson, *Smallpox: Clinical and Epidemiological Features*, EMERGING INFECTIOUS DISEASES (July-Aug. 1999), at 537, *available at* http://www.cdc.gov/ncidod/EID/vol5no4/henderson.htm (last visited Feb. 17, 2003). For a general background on smallpox, see World Health Organization, *Smallpox Fact Sheet*, *available at*

simple delivery mechanisms could lead to widespread casualties.[30] It is similar to exotic agents in that it is extremely difficult to acquire. It is believed that the virus has been eradicated in nature, with two remaining samples stored in the United States and Russia.[31] However, many reports exist that samples of the virus now exist in other locations.[32] Although a vaccine for smallpox exists that can be effective up to five days after infection, routine vaccinations in the United States have not occurred for over twenty years. Currently, an insufficient supply of vaccine exists to protect the public.[33]

Smallpox may be the most dangerous bioweapon. It could be capable of producing a worldwide catastrophe with fatalities reaching into the hundreds of millions in an unweaponized form with a simple delivery mechanism. Two major restrictions on the use of smallpox as a weapon exist. First, it is extremely difficult to acquire. Second, any use of smallpox would likely lead to a pandemic that would affect every nation, including the state (or home of the non-state group) that initially released the virus. Therefore, it is unlikely that a rational actor would use such a weapon.

3. Conclusion

This division of agents into three categories is useful for evaluating the type of actor who would use a given agent and the type of threat that they present. Unsophisticated actors would be more likely to use common agents, which do not represent as serious a threat as the other agents. On the other hand, sophisticated actors might be able to develop and use exotic agents, which represent a greater threat. While smallpox is perhaps the greatest threat, it is likely that only a few state actors possess the virus.

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http://www.paho.org/English/DPI/ pr011022.htm (last visited Feb. 17, 2003).

30. The virus kills about one-third of its victims and is believed to have caused 5000,000,000 deaths in the twentieth century. *60 Minutes*, *supra* note 28. Once Cortez's crew introduced the virus into the virgin Aztec population, it is estimated to have killed 3.5 million Aztecs in two years. Jamie Talan & Liam Pleven, *America's Ordeal*, NEWSDAY, Nov. 6, 2001, at A04.

31. The two official storage sites are the CDC in Atlanta and the Vector facility in Novosibirsk, Russia. Shannon Brownlee, *Clear and Present Danger*, WASH. POST, Oct. 28, 2001, at W08. There have been no reported cases of smallpox since 1977. *Id.* While both of these samples were slated for destruction, this has been postponed due to fear that there may be other samples of the virus in existence. Henderson, *supra* note 29, at 538.

32. *See, e.g.*, Brownlee, *supra* note 31, at W08 (listing countries suspected of having smallpox weapons programs); *Hearings*, *supra* note 3 (same).

33. *See* Talan & Pleven, *supra* note 30, at A04.

B. Types of Actors

Having identified the agents that may be used as bioweapons, it is important to identify the types of actors that would utilize these agents, what resources they would have and need, their motivations for using bioweapons, and what agents they would be likely to use. The potential users of such weapons could be broadly broken down into state and non-state actors. First, past uses of bioweapons by both state and non-state actors will be examined. Second, this information will be applied to modern actors to evaluate their potential for use of bioweapons

1. Historic Uses by State Actors

"[Y]ou will do well to try to inoculate the Indians by means of the blankets, as well as to try every other method that can serve to extirpate this execrable race."

- Orders to British troops in 1763 to deliver blankets contaminated with smallpox to Native Americans.[34]

The use of bioweapons by states dates back over 2,500 years.[35] Modern use of bioweapons began during World War I, when German soldiers infected livestock exports bound for Allied nations with anthrax and glanders.[36] Between World War I and World War II, the infamous Unit 731 of Japan conducted widespread work on bioweapons in occupied Manchuria.[37] World War II saw many other nations involved in both widespread[38] and individually targeted[39]

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34. Keefer, *supra* note 13, at 113.

35. Ancient Athenians used toxic plants to try to poison the water supplies of other cities as early as 600 B.C. *Id.* at 112-113. In 1346, Mongols besieging the Crimean city of Caffa catapulted plague infested corpses into the city. When fleeing civilians brought the disease to Europe, it started an epidemic that killed one-quarter of Europe's population. *Id.* at 113. During the American Civil War, fleeing Confederate soldiers drove animals into ponds and shot them in attempts to contaminate the water supply for advancing Union forces. *Id.*

36. *Id.* Tell, *supra* note 7, at 29.

37. Thousands of Chinese were killed during 1932-1945. *Id.* at 29. The Japanese were allegedly working on plague, cholera, and typhoid. Keefer, *supra* note 13, at 114. During this period, Belgium, France, Canada, Great Britain, Italy, the Netherlands, Poland, and the Soviet Union were also developing bioweapons programs. *Id.*

38. For example, Britain prepared 5,000,000 "cattle cakes" laced with anthrax for an anticipated "Operation Vegetarian" against Germany. Tell, *supra* note 7, at 29. By 1944, the United States had prepared 5,000 anthrax bombs that were ultimately not deployed. *Id.* Japanese forces released plague-infested fleas during conflicts in Manchuria. *Bioweapons, supra* note 2. In 1942, Russia deployed pneumonic tularamia in an attempt to halt advancing Nazi forces. Jack Woodall, *The Soviet Bioweapons Programme: An Insider's View*, THE LANCET, Oct. 30, 1999, at 1568.

39. In 1942, the British secret service used botulinum toxin to assassinate Reinhard Heydrich, the presumed successor to Hitler. Alexandra Witze, *Biological Warfare No Longer*

use of bioweapons. Following WWII, most state use of bioweapons has been as tools of assassination.[40] By far the biggest development of bioweapons was the Biopreparat program by the Soviet Union from 1972 to 1992.[41] Although reportedly no longer in existence, the Soviet program created tons of various weaponized agents and even deployed them in combat.[42]

State development of bioweapons has involved a great variety of agents including common agents, exotic agents, and smallpox. Although initially state actors used bioweapons for widespread effects and even as battlefield weapons, their overall use in these situations proved ineffectual and unpredictable.[43] Even prior to the BWC in 1972, most states had stopped using these weapons at all or restricted their use as a strategic deterrent or as tools of assassination. During this same time period, many states continued to develop chemical weapons because their predictable and limited effects were much better suited to battlefield use.

2. *Historic Uses by Non-State Actors*

The use of bioweapons by non-state actors is a relatively recent phenomenon. One of the earliest examples is a Japanese researcher who contaminated food with typhoid from 1964 to 1966, infecting over 100 people.[44] In 1972, neo-nazis were caught in the United States with over thirty kilograms of typhoid bacteria, intending to poison water supplies.[45] In 1984, the Rajneeshee cult in Oregon attempted to influence a local election by contaminating salad bars

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Desperate Measure, DALLAS MORNING NEWS, Oct. 27, 2001, at 39A.

40. In 1978, the Soviets used ricin to kill Bulgarian defector Georgi Markov in London. *Bioweapons, supra* note 2. South Africa has also been accused of using bioweapons for assassination during the Rhodesian Civil War in the 1970's. Keefer, *supra* note 13, at 117. An outbreak of anthrax during 1979-1980 in Zimbabwe is also suspected of being a bioweapon attack by the white Rhodesian army. Tell, *supra* note 7, at 29.

41. The facility in Stepnogorsk, Kazakhstan, which was built in 1982, had ten 20,000-liter fermentation vats, which could produce 300 tons of anthrax in a 220-day cycle. Judith Miller et al., *A Horrifying Revelation in Kazakhstan*, TIMES UNION, Nov. 5, 2001, at A1 [hereinafter Miller et al., *Revelation*]. Overall, Biopreparat employed over 30,000 people, including over 7,000 scientists at 50 different laboratories. *The O'Reilly Factor: Interview with Bill Kurtis* (Fox News Network television broadcast, Oct. 26, 2001), *available at* 2001 WL 5081847.

42. The Soviet program weaponized anthrax, Ebola, and Marburg, among other agents. Wendy Orent, *After Anthrax*, AM. PROSPECT, May 8, 2000, at 18. During their invasion of Afghanistan, the Soviets released glanders on Mujahedin forces. Woodall, *supra* note 38, at 1568.

43. For example, Russian forces stopped a Nazi advance in 1942 through the use of pneumonic tularemia, but the attack backfired when the outbreak returned to infect the Russian army. Woodall, *supra* note 38, at 1568.

44. Ali Khan et al., *Precautions Against Biological and Chemical Terrorism Directed at Food and Water Supplies*, 116 PUB. HEALTH REP. 3, 5 (2001). It is hypothesized that the researcher used the agent in an attempt to gather data for his doctoral thesis. *Id.*

45. Kellman, *Biological Terrorism*, *supra* note 7, at 443.

with salmonella, causing 751 illnesses.[46] Before releasing sarin gas during a chemical weapons attack on a Tokyo subway, Aum Shinrikyo had attempted to weaponize and release botulinum toxin and anthrax.[47] In 1995, Aryan nation member, Larry Wayne Harris, was arrested for ordering bubonic plague through the mail.[48] Also in 1995, two Minnesota militia members were caught trying to use ricin to attack government officials.[49] In 1996, a disgruntled hospital employee contaminated muffins and doughnuts with *Shigella dysenteriae* in Dallas.[50]

A number of conclusions can be drawn from these examples. First, none of the attacks caused widespread harm. The broadest effect was that caused by the Rajneeshee's, who caused over 700 illnesses.[51] However, none of these attacks caused more than a few fatalities. Most of the attacks were never carried out or were not very effective. Second, there are two general types of non-state actors who actually use these weapons. As the 1962 and 1996 incidents show, one type includes disgruntled lone actors who work around biological agents.[52] These attacks have included common agents and exotic agents to which the actor had access.[53] While these actors appear more effective in causing death, the scopes of the attacks have been limited, and no widespread effect appears to have been intended.

The other type of non-state actors include religious extremists.[54] They appear to intend much broader effects but have failed to achieve them.[55] For example, Aum Shinrikyo spent years and millions of dollars attempting to create bioweapons, yet failed to accomplish much.[56] While limited casualties have been possible, non-state actors have not yet demonstrated the ability to yield bioweapons as weapons of mass destruction.[57] Attempts to develop exotic agents have generally failed, and the use of common agents has not lead to widespread harm.

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46. Khan et al., *supra* note 44, at 5.

47. Schechter & Arnon, *supra* note 17, at 238. In 1992, the cult sent a team to Zaire in a failed attempt to acquire Ebola. Kellman, *Biological Terrorism*, *supra* note 7, at 425.

48. Barry Kellman, *Catastrophic Terrorism – Thinking Fearfully, Acting Legally*, 20 MICH. J. INT'L L. 537, 552 (1999) [hereinafter Kellman, *Catastrophic Terrorism*].

49. Keefer, *supra* note 13, at 118.

50. Khan et al., *supra* note 44, at 5.

51. *Id.*

52. This is the Federal Bureau of Investigation's current theory for the 2001 anthrax attacks. *See* FBI, *supra* note 4.

53. *Id.*

54. Religious actors such as the Japanese cult, Aum Shinrikyo, represent this type of actor. Schechter & Arnon, *supra* note 17, at 238; Brownlee, *supra* note 31, at W08.

55. *See* FBI, *supra* note 4; Brownlee, *supra* note 31, at W08.

56. Schechter & Arnon, *supra* note 17, at 238; Brownlee, *supra* note 31, at W08.

57. Schechter & Arnon, *supra* note 17, at 238.

3. Current Uses by State Actors

Some experts believe that state actors are the major threat of bioweapons. Because it is so difficult to acquire, it is believed that only a state could have smallpox right now.[58] The difficulties of weaponization have led some to believe that only a state could have produced the anthrax that was used in the recent attacks.[59] Although the exact list of states with bioweapons is not known, the CIA[60] and other experts[61] believe that approximately one dozen nations have bioweapons programs. Some nations may be drawn to bioweapons as a cheaper and easier alternative to nuclear weapons for use as a strategic deterrent.[62] One reoccurring fear is that scientists who were formerly employed in the Soviet bioweapons program have been drawn to Iraq or Iran to work on bioweapons programs.[63] State actors would have the resources to develop exotic agents, and may also have the ability to acquire smallpox. Current examples include:

> *Iraq*: Iraq is known to have a bioweapons program.[64] By 1990, Iraq had 150 bombs with 60-85 liter payloads of botulinum toxin, anthrax, or aflatoxin.[65] In total, the Iraqi government is believed to have

58. Brownlee, *supra* note 31, at W08. Some experts believe that Russia, Iraq and North Korea have the virus and suspect that China, Libya, South Africa, Israel, and Pakistan might have the virus. *Id. See also Hearings, supra* note 3 (quoting Dr. Kenneth Alibek as saying he knew North Koreans were working on smallpox and that Iraq was working on camelpox as a surrogate).

59. *E.g.*, Weiss & Eggen, *supra* note 10, at A01. *But see* FBI, *supra* note 4 (hypothesizing that a lone actor is responsible for the attacks).

60. *See* Tara O'Toole & Thomas Inglesby, *Facing the Biological Weapons Threat*, THE LANCET, Sept. 30, 2000, at 1129 (listing the number of states that the CIA believes possess bioweapons programs).

61. *See, e.g.*, Will Englund, *USSR One of Many Sources for Anthrax*, BALTIMORE SUN, Oct. 17, 2001, at 8A (listing Iraq, North Korea, Iran, China, Libya, Syria, Taiwan, Pakistan, India, Israel, Egypt, South Africa, and Sudan).

62. *See* Keefer, *supra* note 13, at 112 (describing the role of biological weapons as strategic assets).

63. *See, e.g.*, Nicholas Kralev, *Anthrax Stirs US Review of Foreign Germ Programs*, WASH. TIMES, Oct. 22, 2001, at A16. Vector scientists only earn $100 a month in Russia. *See* Talan & Pleven, *supra* note 30, at A04. Iran has offered $5,000 a month for their services. *See* Brownlee, *supra* note 31, at W08. Plans to transform old facilities into legitimate biotech facilities have failed. Miller et al., *Revelations*, *supra* note 41, at A1.

64. *See, e.g.*, JUDITH MILLER ET AL., GERMS: BIOLOGICAL WEAPONS AND AMERICA'S SECRET WAR 98-150 (2001) (describing Iraq's bioweapons program).

65. Keefer, *supra* note 13, at 111.

10,000 liters of botulinum toxin[66] and to be working on either smallpox itself or related viruses.[67]

China: A recent outbreak of hemorrhagic fever in Northeastern China sparked concern because there had been no previous cases in the affected area.[68] Subsequent reports showed facilities in the area with fermenters and biocontainment equipment, which led many to hypothesize that China was pursuing a bioweapons program. [69]

Russia: Although the Soviet weapons program officially ended in 1992, the former deputy head of the program believes that the program may still exist.[70] Russian officials admitted in 1999 that military labs continue to research Ebola and Marburg, although supposedly only for treatment purposes.[71]

Iran / Cuba: While neither country is known to have bioweapons programs, both are suspected of pursuing such programs and have extremely well-developed biotechnology sectors.[72]

As shown, a number of states have well-developed bioweapons programs. These programs include common agents, exotic agents, and smallpox. These various bioweapons represent a serious threat to the safety of the world. However, the ineffectual use of such agents on the battlefield would characterize these weapons as more of a strategic asset rather than a military one. States would likely use such assets as negotiation tools in deterring other states from using weapons of mass destruction. While bioweapons have been used during the 20th century during armed conflict, unexpected and negative consequences have shown them to be ill-suited for military

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66. Schechter & Arnon, *supra* note 17, at 238. This amount of the toxin is hypothetically sufficient to kill over 300 billion people.

67. *Hearings, supra* note 3 (testimony of Dr. Kenneth Alibek, stating that Iraq was working on camelpox as a surrogate for smallpox).

68. Woodall, *supra* note 38, at 1569.

69. *Id.*

70. Andrew Jack, *Extent of Russian Bioweapons Programme Generates Fear*, FIN. TIMES, Oct. 26, 2001, at 5 (*quoting* Dr. Alibek's fears of a continuing program).

71. Orent, *supra* note 42, at 18. This claim seems suspicious in light of the fact that Ebola and Marburg are not endemic to any Russian territory. *Id.*

72. *See Hearings*, *supra* note 3 (testimony of Dr. Alibek).

use. The most powerful agents, which are highly infectious, could be transmitted back into the state that released them. Therefore, states may be even less likely to use bioweapons than nuclear weapons.[73]

4. Current Uses by Non-State Actors

While some experts believe that only a state could have the resources to pursue bioweapons, other experts have identified non-state actors as a greater threat.[74] Bioweapons clearly have advantages that would appeal to terrorists, such as the potential for high death to cost ratios; the ability to smuggle small, undetectable, yet effective quantities; and the ability to cause mass panic.[75] However, some experts have viewed the failures of non-state actors with sophisticated resources to develop effective bioweapons as proof that such weapons are not within the grasp of non-state groups.[76]

Non-state actors could be divided into three general categories: political terrorists, religious terrorists, and disgruntled loners. This first group would probably not use bioweapons, but the latter two may. "Political terrorist" encompasses the 1970's and 1980's view of terrorists, including social revolutionaries and national separatists.[77] These are groups that are motivated by political goals, and want to influence the political decisions that are made in the West.[78] Therefore, they are likely to avoid the humanitarian outrage that weapons of mass destruction would evoke.[79] In focusing on discrete targets, conventional weapons would be much cheaper and much more effective.[80] While it is possible that such a group would pursue the development of bioweapons, it would be for

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73. However, it also may be harder to detect or trace back a bioweapons attack. This might make such weapons more attractive to use.

74. *See, e.g., Panel II of the Hearing of the Technology, Terrorism, and Government Information Subcommittee of the Senate Judiciary Committee*, FED. NEWS SERV., Nov. 6, 2001 [hereinafter *Panel II*] (testimony of Michael Drake, Vice President of Health Affairs for the University of California).

75. *See* Kellman, *Biological Terrorism*, *supra* note 7, at 427.

76. *See The O'Reilly Factor*, *supra* note 41 (reporting that Aum Shinrikyo spent millions of dollars and years trying to develop anthrax and botulinum, but failed to create effective weapons).

77. *See Hearings*, *supra* note 3 (testimony of Jerrold Post, political psychiatrist and psychologist who interviews terrorists).

78. *See id.*

79. *See* Barry Kellman, *Review Essay: Clashing Perspectives on Terrorism*, 94 AM. J. INT'L L. 434, 435-436 (2000) [hereinafter Kellman, *Review Essay*] (reasoning that such groups would want to influence the existing political structure and attract adherents, and, therefore, would not take actions that would lead to complete outrage in public opinion).

80. *See Hearings*, *supra* note 3 (testimony of Jerrold Post, political psychiatrist and psychologist who interviews terrorists).

similar reasons as a state: for use as a strategic asset rather than as a weapon.[81] Such groups have not been shown to be involved with bioweapons so far.[82]

Religious terrorists, on the other hand, would utilize bioweapons because their goals are very different.[83] Their goals include widespread damage, and they are not as concerned with political repercussions.[84] Such groups have no real political agenda and are not trying to build a movement or negotiate with the existing power structure.[85] Right-wing groups such as the Montana Militia and Aryan Nation are included within this group because of the close ties of their tenets to extreme religious philosophies and similar disregard for political fallout of actions.[86] Most bioweapons use by non-state groups has been by entities falling within this classification.[87] Some evidence exists that current groups within this category are attempting to acquire or develop bioweapons.[88] While previous attempts have proved largely ineffective, new delivery techniques such as suicide human vectors[89] may get around many previous problems with delivery mechanisms. However, such weapons would likely be limited to common agents due to the difficulty of acquiring and developing exotic agents or smallpox.

The third group, disgruntled loners, represents a threat of bioweapons, but not of widespread usage. Past incidents have involved lone actors using resources obtained from their employment.[90] While some experts feel that such lone actors represent the biggest threat of future terrorism,[91] the examples of past usage seem to indicate a narrower threat. Such actors are constrained by their access to biological materials. While they may have access to exotic agents, they do not have sophisticated

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81. *Id.*
82. *Id.*
83. *Id.*
84. *Id.*
85. *See* Kellman, *Review Essay*, *supra* note 79, at 435.
86. *See, e.g, Hearings*, *supra* note 3 (testimony of Jerrold Post, political psychiatrist and psychologist who interviews terrorists).
87. For a review of bioweapon use by non-state actors, see discussion *supra* Part II.B.2.
88. *See, e.g.*, Englund, *supra* note 61, at 8A (examining unconfirmed reports that bin Laden got anthrax from Czech Republic or North Korea); *Kenya, A Weapon of Choice in Biological Warfare*, AFR. NEWS, Oct. 19, 2001 [hereinafter *Kenya*] (reporting that members of Egyptian Islamic Jihad claimed to have bioweapons in 1999).
89. "Suicide human vector" refers to deliberately infecting human agents with a contagious disease, and then instructing the agent to try to infect as many people as possible through casual contact. Infected agents would visit crowded enclosed areas, such as shopping malls or movie theaters, and try to infect others. The Japanese used such techniques in a battlefield setting with some success in Manchuria. Keefer, *supra* note 13, at 114.
90. *See* discussion *supra* Part II.B.2.
91. *E.g.*, Kellman, *Review Essay*, *supra* note 79, at 435.

equipment or developmental capabilities beyond acquiring those agents that could easily be acquired. While the recent anthrax attacks may represent the potential reach of such a lone actor,[92] they would involve single, unsophisticated agents and limited delivery mechanisms. If laboratories exist, which work on smallpox or sophisticated exotic agents, there would also be a risk that these agents may be used by a disgruntled employee. However, the risk is small because such laboratories would likely have significant oversight and surveillance.

Non-state actors are limited in the types of agents they could utilize as bioweapons. Common agents such as anthrax or plague could easily be acquired from natural sources.[93] Defunct weapons testing sites such as Vozrozhdeniya Island in the Aral Sea could also be a potential source of a wider range of agents.[94] Exotic agents such as hemorrhagic fevers would likely be too difficult to acquire and to culture for non-state actors to possess.[95] Smallpox could probably not be acquired, absent transfer from a state, which is not likely due to the extreme political repercussions that would follow if such a transfer were discovered.

C. The Current Threat

Non-state religious terrorists are the greatest threat because they are the actors most likely to use bioweapons in an attempt to cause widespread harm. They have demonstrated the desire to acquire and to deploy such weapons, although their attempts to actually use such weapons have been limited to common agents and have not caused widespread harm so far. State actors have much more sophisticated weaponry, including exotic agents and smallpox, which would be effective in causing casualties if deployed. While states themselves are unlikely to actually use such weapons, the development of such agents raises the fear that religious terrorists may acquire the agents.[96] The existence of extreme religious terrorist groups with close ties to states also raises the possibility of such transfers. Therefore, the existence of state programs raises the

92. *See, e.g.*, FBI, *supra* note 4 (hypothesizing that a loner actor is responsible for the recent anthrax attacks).

93. *See* discussion *supra* Part II.A.1.

94. *See* Orent, *supra* note 42, at 18 (noting that the island has been inundated with many different weaponized agents).

95. *See* Kellman, *Biological Terrorism*, *supra* note 7, at 440.

96. Either accidentally, such as from old testing sites, or intentionally, such as reported for bin Laden acquiring anthrax. In a dying declaration, King Hussein of Jordan warned of smallpox being reintroduced into the world. *60 Minutes*, *supra* note 28.

threat of bioweapons, although it may be non-state actors who are actually employing them.

It is crucial to stop the proliferation of these weapons because medical and public health response would not likely be able to prevent widespread harm. Public health surveillance may be inadequate to detect bioweapons events early enough,[97] and potential treatments may not be effective,[98] or available, in sufficient quantities to respond to threats. Recent simulations of infectious bioweapon releases have predicted catastrophic consequences.[99] Therefore, all steps must be taken to ensure that the threat of bioweapons is adequately controlled.

III. THREAT RESPONSES

Four types of responses to the threat of bioweapons have been used or proposed. The first is an international agreement, such as the BWC. The second is an inspection regime. The third is restrictions on the materials necessary to develop and use bioweapons. The final option is criminalization of bioweapons.

A. The 1972 Bioweapons Convention

"The [Biological Weapons Convention] needs enforcement teeth if we are to have confidence it is being respected around the world."

- 1998 Statement by Madeline Albright, United States Ambassador to the United Nations.[100]

97. *See* Debora MacKenzie, *Under Surveillance*, NEW SCIENTIST, Apr. 8, 2000, at 1616 [hereinafter MacKenzie, *Under Surveillance*] (discussing the probable inadequacy of a public health response to a biological attack).

98. *See* Hillel W. Cohen et al., *Bioterrorism "Preparedness": Dual Use or Poor Excuse?*, 115 PUB. HEALTH REP. 403, 404 (2000) (noting that the anthrax vaccine has never been proven effective against weaponized forms); Kelly Morris, *US Military Face Punishment for Refusing Anthrax Vaccine*, THE LANCET, Jan 9, 1999, at 130 (noting that some experts doubt vaccine's efficiency); Nass, *supra* note 11, at 492 (reporting that the only manufacturer of the anthrax vaccine received 11-pages of quality control failures from FDA inspectors).

99. A recent two-day simulation at Andrews Air Force Base started with twenty-four smallpox cases in the United States and ended two weeks later with the vaccine supply exhausted, 15,000 infections, 1,000 deaths, and a 10-fold increase in infections expected every two weeks. Another simulation starting with 100 cases in a United States city led to a worldwide catastrophe within 1 year. *See* Brownlee, *supra* note 31, W08.

100. Helen Gavaghan, *Arms Control Enters the Biology Lab*, SCIENCE, July 3, 1998, at 29.

"[There is] broad agreement that more work needs to be done to examine measures to strengthen the Biological Weapons Convention...."

- 2001 Statement by Philip Reeker, State Department Spokesman.[101]

The 1972 Bioweapons Convention ("BWC") has been ineffectual at stopping the proliferation of bioweapons. Although 143 nations have ratified the convention,[102] many countries, including some of those who have ratified the convention, have continued to produce bioweapons.[103] The Soviet bioweapons program even experienced a rapid expansion after the 1972 convention.[104] Compliance with the treaty has been extremely difficult to monitor.[105] Additionally, such conventions have no power to deter terrorist groups that are seeking to acquire or to use such weapons.[106] Therefore, it is necessary to utilize measures beyond the BWC to combat the threat of bioweapons.

B. Inspections

Inspections have been proposed by many parties as a solution to the inefficacy of the BWC. First, the structure of the BWC Protocol's inspection regime will be analyzed. Second, the costs of such an inspection program will be evaluated. Third, possible constitutional challenges to inspections will be reviewed. Fourth, the efficacy of the inspection regime will be evaluated as to different threats. Finally, a summary of the net value of inspections will be presented.

1. BWC Protocol

The recent draft proposal for an inspection regime for the BWC included both random transparency visits and challenge visits.[107] Similar to the Chemical Weapons Convention ("CWC"), the Protocol

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101. *Philip Reeker Holds State Department Briefing*, FDCH POL. TRANSCRIPTS, July 23, 2001 [hereinafter *Briefing*].

102. *See Kenya, supra* note 88 (stating 17 other nations have signed the BWC, but have not yet ratified it).

103. *See* discussion *supra* Part II.B.3.

104. *See Russia Could Reactivate Biological Weapons in Months*, AGENCE FR. PRESSE, Apr. 6, 1999, *at* 1999 WL 2577987.

105. *See* Matthew Linkie, *The Defense Threat Reduction Agency: A note on the United States' Approach to the threat of Chemical and Biological Warfare*, 16 J. CONTEMP. HEALTH L. & POL'Y 531, 533 (2000).

106. *See id.* at 552.

107. *See Bioweapons, supra* note 2. For the text of the Protocol, see http://www.un.org/Depts/dda/WMD/bwc/index.html (last visited Feb. 13, 2003).

would create three bodies: a general Conference of State Parties, an Executive Council to make decisions regarding compliance, and a Technical Body to conduct inspections.[108] Members could request challenge inspections for both state and non-state facilities as well as field-testing for suspected releases.[109] A member being investigated would have the right to limit access to sensitive areas unrelated to the claim of non-compliance.[110]

2. *Costs of Inspections*

"I'm not sure that anyone can guarantee confidentiality."

- Helmut Bachmayer, Head of Corporate Biosafety for Novartis.[111]

"[I]f I come to a new facility or any facility and see some equipment . . . it says absolutely nothing to me"

- Ken Alibek, former Deputy Head of the Soviet bioweapons program, testifying before Congress on the lack of threat to proprietary information.[112]

The Bush administration and industry groups have identified a number of concerns over the proposed inspection regime. The major concerns are threats to intellectual property and threats to national security.[113] Although the industry concerns are legitimate, especially in light of the potential scope of inspections,[114] experience with the CWC and the views of industry representatives have indicated that many of these threats could be adequately minimized

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108. *See* Keefer, *supra* note 13, at 132-133.
109. *See id.* at 136.
110. *See id.*
111. Gavaghan, *supra* note 100, at 29.
112. *Hearings, supra* note 3.
113. *See, e.g.*, Glenda Cooper, *U.S. Rejects Biological Arms Ban Protocol*, WASH. POST, July 26, 2001, at A01 (stating that almost all of the 55 nations party to the draft negotiations supported the proposal); Lynn C. Klotz, *Means for Protecting U.S. Industry Within an Effective Compliance Regime for the Biological Weapons Convention*, 12 DEPAUL BUS. L.J. 329, 331 (2000). Other nations, including China and India, have expressed concerns over inspection regimes. *See* Debora MacKenzie, *Biowar Checks Hang in the Balance*, NEW SCIENTIST, Nov. 23, 1996, at 1111 [hereinafter MacKenzie, *Biowar*].
114. *See* Gavaghan, *supra* note 100, at 29 (predicting hundreds of facilities would come within scope of inspection criteria); Caroline Linton, *Boston Labs: Anthrax Secure*, U-WIRE, Oct. 30, 2001, at *1-2 (noting that many labs in the Boston area work with some form of anthrax); Cooper, *supra* note 113, at A01 (stating that approximately 40% of the world's biotech firms are located within the United States). Other estimates are that there are approximately 250 university labs and 300 private labs in the United States that work on restricted pathogens and would, therefore, be subject to inspection. *Panel II, supra* note 74.

with an effective inspection regime.[115] The threat to national security could also be minimized through restrictions on the scope of inspections.

> *Intellectual Property*: There are two types of information that it is feared may be compromised: proprietary microorganisms and other confidential information.[116] In the biotech industry, the microorganism itself is often the most valuable asset.[117] Because only a miniscule amount of microorganism would need to be taken to steal the technology, there is an added threat that does not exist under the CWC.[118] However, it may be possible to limit the risk of such a theft. Inspectors could be required to use non-viable testing only, which would mean that live organisms would never leave the facility and could not be stolen.[119] The limited immunities within the current Protocol also allow for inspectors and other employees to be held civilly liable for theft of confidential information or proprietary microorganisms.[120]
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> As compared to chemical plants, merely viewing the equipment in place at a biotech facility would not reveal as much useful information.[121] Unlike the chemical industry, where complex processing is often the crucial technology, the biotech industry revolves around microscopic phenomena that are not easily revealed. Many industry representatives have even expressed their acceptance of proposed inspection regimes.[122] While there is some uncertainty, it

115. The BWC has not had a single accusation of theft of proprietary information after almost 50 years of inspections. *LA Times Urges Administration Support for Bioweapons Treaty*, BULLETIN'S FRONTRUNNER, Nov. 5, 2001.

116. *See* Klotz, *supra* note 113, at 338.

117. *See id.*

118. *See id.*

119. *See id.*

120. *See* Keefer, *supra* note 13, at 132-33.

121. *See Hearings*, *supra* note 3 (testimony of Dr. Kenneth Alibek, former deputy head of Biopreparat, the Soviet Union's bioweapons program, and President of Advanced Biosystems, Inc., stating that merely having inspectors within a biotech facility would not reveal any proprietary information).

122. *E.g.*, Klotz, *supra* note 113, at 342 (author is a consultant to biotech industry); *Marketplace Health Desk* (Nat'l Public Radio, Nov. 5, 2001), audio *available at* http://marketplace.org/features/health_desk/ [hereinafter *Marketplace*] (citing Barbara Hatch Rosenberg, head of the Federation of American Scientists, as saying inspections could protect

appears that an inspection regime could include enough safeguards to satisfy the biotech industry's concerns regarding proprietary information.

National Security: The Bush administration has rejected the proposed inspection regime partly out of fear of a threat to national security.[123] Potential threats include harassment of government labs through excessive and disruptive challenge visits,[124] undermining technology export regulations,[125] and compromising defensive research into bioweapons.[126] While these threats are legitimate concerns, it may be possible to design the inspection Protocol to protect against them. Exportation of technology could be prohibited by restricting testing to on-site or non-viable mechanisms. The effect on government research could be avoided through the use of a right to refuse inspections, such as that included in the CWC,[127] or the right to limit the scope of inspections as set forth in the draft Protocol.

While there are legitimate threats from an inspection regime, it appears likely that such threats could be dealt with in designing the protocol for inspections. Industry groups have shown a willingness to accept inspections, and the chemical industry has submitted to inspections without incident for many years. Government security concerns could also be dealt with, if necessary, by reserving the right to deny access to inspectors. Unless the United States is protecting a clandestine bioweapons program of its own, the inspections should not present a serious problem.

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proprietary strains and information).

123. *See* Cooper, *supra* note 113, A01 (*quoting* United States negotiator Donald A. Mahley: "In our assessment, the draft protocol would put national security and confidential business information at risk").

124. *See id.*

125. *See id.*

126. *See Inspect and Survive*, NEW SCIENTIST, Nov. 3, 2001, at 33 [hereinafter *Inspect and Survive*].

127. *See* Michael P. Scharf, *Clear and Present Danger: Enforcing the International Ban on Biological and Chemical Weapons Through Sanctions, Use of Force, and Criminalization*, 20 MICH. J. INT'L L. 477, 485 (1999).

3. Constitutional Issues of Inspections

The use of an inspection regime may implicate the Fourth Amendment.[128] Similar constitutional issues exist under the CWC, since the CWC authorizes the federal government to inspect chemical facilities without a search warrant.[129] While under the BWC, international inspectors would be carrying out the inspection rather than federal agents, however, they would likely be judged as "state actors."[130] Therefore, rights under the Fourth Amendment would be implicated.

While challenge visits would have to be authorized by the Executive Council under the current Protocol, this would unlikely satisfy the warrant requirement due to the Council's inability to be neutral and detached. The Council would have the responsibility to ensure compliance with the BWC, and therefore, it may be viewed as an executive body.[131] However, these searches may be constitutional under the "Special Needs" exception to the warrant requirement.[132] If the primary purpose of the inspection is not a criminal investigation, the courts will balance the nature of: 1) the privacy interest at stake; 2) the intrusion; and 3) the government's interest.[133]

The Supreme Court has broadly applied the "special needs" doctrine[134] and would likely apply it here, due to the threat that bioweapons pose to both public health and national security. Because the potential harm from bioweapons is uniquely devastating, courts would likely find a "special need." The privacy at stake is the same as those of factories and laboratories, as opposed to individuals; thus, courts would not likely attach much weight to the privacy interest or the intrusion. Courts would further recognize that biotechnology is a heavily-regulated industry, and therefore should not expect a great deal of privacy.[135] In

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128. "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrant shall issue, but upon probable cause." U.S. CONST. amend. IV.

129. *See* Linkie, *supra* note 105, at 562 (discussing the constitutional implications of such searches).

130. *See* Debbie Ryan Bing-Zaremba, *Knock, Knock, Who's There? Can Chemical Weapons Inspectors Enter U.S. Facilities Without a Search Warrant?*, 11 TEMP. INT'L & COMP. L.J. 57, 66-67 (1997).

131. For a detailed analysis of this issue, see *id.* at 69-71.

132. *See* Kellman, *Biological Terrorism*, *supra* note 7, at 478-79.

133. *Id.* at 479.

134. *See, e.g.*, Griffin v. Wisconsin, 483 U.S. 868, 875 (1987) (recognizing the role of probation officers for the government's interest in rehabilitation); Camara v. Mun. Ct. of San Francisco, 387 U.S. 523, 535-36 (1967) (recognizing the government's interest in housing inspections).

135. *See, e.g.*, Skinner v. Ry. Labor Executives' Ass'n, 489 U.S. 602 (1989) (reasoning that

addition, courts have given broad discretion to government decisions that involve national security[136] and international relations.[137] For all of these reasons, it would be very likely that courts would find the proposed inspection regime constitutional.

4. Efficacy of Inspections

Even if the costs of inspections can be minimized, they may not provide a powerful tool in the fight against bioweapons. Part of the attractiveness of the CWC was the ability to inspect alleged violators' chemical weapons.[138] Large, complex, and immobile facilities are needed to produce substantial quantities of chemical agents. However, with biotechnology, small-scale production could easily be hidden with one or two weeks notice of an impending inspection.[139] One of the Bush administration's biggest criticisms of the proposed inspection regime is that it would be possible to circumvent detection.[140] States may be able to delay inspections long enough to destroy any evidence of violations. The experience of United Nations inspectors in Iraq demonstrates the difficulty in detecting a bioweapons program.[141] Inspections would not be able to reach non-state actors if their facilities were not large enough or visible enough to be subject to an inspection regime.

While not foolproof, inspection regimes may still deter or retard the development of bioweapons. Developing exotic agents may require the type of facilities that would fall under the inspection regime. Even if inspections could not stop a state from pursuing a program, they may significantly raise the cost of conducting research and thereby deter such research.[142] One of the motivations for state bioweapons research is the fear that the United States possesses such weapons.[143] Greater transparency may reduce this motivation and discourage countries from seeking bioweapons.

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because the train industry is heavily regulated, it should not expect or receive great privacy protection).

136. *E.g.*, Korematsu v. United States, 323 U.S. 214 (1944) (giving very broad deference to decision to inter Japanese-Americans due to national security concerns).

137. *E.g.*, State v. Holland, 252 U.S. 416 (1920) (holding that Congress can pass laws pursuant to the treaty power that would be unconstitutional if passed for solely domestic reasons).

138. *See* Bing-Zaremba, *supra* note 130, at 61.

139. *Hearings*, *supra* note 3 (testimony of Dr. Alibek).

140. *See* Bill Nichols, *U.S., Europeans resume talks on bioweapons*, USA TODAY, Oct. 23, 2001, at 4A.

141. *See* JUDITH MILLER ET AL., *supra* note 64, at 98-150 (detailing the experience of the United States and the United Nations with Iraq's biological weapons program).

142. *See* Kellman, *Catastrophic Terrorism*, *supra* note 48, at 553; Cohen et al., *supra* note 98, at 404.

143. *See* Kellman, *Catastrophic Terrorism*, *supra* note 48, at 553.

Even if non-state actors are the largest threat, they may disguise their efforts behind legitimate fronts that would be reached by the inspections.[144] Additionally, curtailing state-based programs would reduce the risk of accidental or intentional transfer of technology or agents to non-state actors. Therefore, inspections may help combat both state and non-state actors from developing or acquiring bioweapons.

5. *Conclusion*

The potential costs of inspection regimes could likely be avoided by building in adequate safeguards, such as non-viable testing to prohibit theft of microorganisms, by limiting the scope of inspections to specific challenges, and by refusing inspections in order to protect national security interests. Although inspections would not eliminate the threat of bioweapons, it may discourage state actors from pursuing programs and hinder non-state actors in their efforts. While not completely effective, the benefits of inspections appear to outweigh the costs of such a system.

C. Restrictions on Equipment

One of the alternatives that the Bush administration has proposed is expansion and strengthening of the Australia Group, a group of approximately thirty nations formed in 1985 that restricts the sale and export of the high-tech equipment needed to develop weapons of mass destruction.[145] This section will first analyze restrictions on seed cultures for bioweapon agents. Second, this section will review restrictions on the equipment needed to culture and weaponize such agents. Finally, it will summarize the ability of such restrictions to combat the development of bioweapons.

1. *Restrictions on Seed Cultures*

If the goal is to restrict the use of biological agents as weapons, it may seem valuable to restrict access to such biological agents. For example, U.S. regulations require registrations for transfers of biological materials.[146] Sales from domestic firms to foreign governments and foreign individuals require the approval of the Commerce Department.[147] The biotech industry supports such

144. Such large facilities might be necessary to develop exotic agents. *See* discussion *supra* Part II.A.2.

145. *See* Cooper, *supra* note 113, at A01 (describing the Australia Group).

146. *See* Heather A. Dagen, Comment, *Bioterrorism: Perfectly Legal*, 49 CATH. U. L. REV. 535, 565 (2000).

147. *See* Eric Nadler & Robert Windrem, *Deadly Contagion: How We Helped Iraq Get Germ*

restrictions of sales.[148] If the microorganisms themselves could be restricted, it would be impossible for state or non-state actors to develop bioweapons.

However, lax restrictions on sales and natural availability of common agents have made restrictions on microorganisms inadequate to combat the threat of bioweapons. It is possible for almost any individual to order cultures through the mail.[149] Although public backlash after reports of a neo-nazi ordering plague resulted in supposedly stricter regulations on sales,[150] it is still possible to acquire many live agents.[151] Even with government approval as a requirement to approve shipments abroad, vast numbers of dangerous organisms have been sold to governments that are now working on bioweapons.[152] Outside the United States, there are also many sources for these agents, whether from previous weapons testing[153] or from foreign firms.[154] Many biological agents have already been marketed to enough parties, and have continued to be marketed so broadly that restrictions on the agents themselves would be ineffectual in the short-run. For some exotic agents and smallpox, however, restrictions on cultures may be important for preventing the development of future weapons.

2. *Restrictions on Weaponizing Equipment*

Because of the ease of acquiring biological agents, the Australia Group has focused on restricting access to the equipment that would be needed to weaponize the agents.[155] Such equipment is necessary

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Weapons, THE NEW REPUBLIC, Feb. 4, 1991, at 18-20.

148. *See Panel II*, *supra* note 74 (testifying that the American Society of Microbiologists supports registration requirements).

149. "[C]ommercial firms offer cultures for a few dollars, and they rarely check whether those placing an order are acquiring it for a legitimate use." Kellman, *Review Essay*, *supra* note 79, at 436.

150. Kellman, *Biological Terrorism*, *supra* note 7, at 451-453 (noting that the CDC now requires establishment licenses for certain facilities, product licenses to sell microbes, and requires that sales and transfers be registered with the CDC).

151. Kellman, *Review Essay*, *supra* note 79, at 436.

152. In the 1980's, the CDC shipped deadly viruses such as West Nile encephalitis to Iraq, Cuba, Soviet Union, and China, and over 130,000 cultures of various organisms are still sold by the firm each year to foreign nations. Nadler & Windrem, *supra* note 147, at 18-20. From 1985 to 1989, the private firm American Type Culture Collection sold 21 strains of anthrax to Iraq, with all of the sales approved by the Commerce Department. Tell, *supra* note 7, at 29.

153. Samples of plague, tularemia, glanders, and anthrax still contaminate Vozrozhdeniye Island, available to anyone with the minimal protection of mask and gloves. *See Hearings*, *supra* note 3 (testimony of Dr. Alibek).

154. Russian scientists are currently marketing antibiotic resistant tularemia from Obolensk, Moscow, and Vienna. Orent, *supra* note 42, at 18. There are over 1,500 repositories worldwide that sell various strains of microorganisms. *Inspect and Survive*, *supra* note 126, at 33.

155. For example, the Australia Group regulates the sale of fermenters, containment

for actors trying to produce bioweapons.[156] Therefore, it might be more effective to regulate sales of such equipment than to try to regulate acquisition of the agents themselves.

However, restrictions on the sales of this equipment have also proved ineffective so far at preventing the spread of the machinery and technology. Both lax enforcement of sales restrictions and the dual-use nature of much of this equipment has complicated these efforts. The type of milling equipment necessary to weaponize anthrax is freely available on the open market for less than the price of an automobile.[157] In a recent survey, ten out of nineteen countries evaluated received failing grades for treaty-required regulation of biotech equipment.[158] Russia was recently exposed for planning to sell 50,000-liter fermenters to Iraq.[159] While sales of such equipment might represent a more effective way to inhibit the development of bioweapons than restricting the agents themselves, the Australia Group has so far failed to restrict such sales enough for the measures to be effective.

3. *Conclusions*

It is possible that regulating the sale and transfer of biological agents and biotech equipment could combat the development of bioweapons. Many exotic agents are difficult or impossible to acquire from natural sources. While some nation-states may be able to work around such barriers, non-state groups could be hampered by such restraints. However, regulatory regimes for both biological agents and equipment have failed so far. Stringent regulation may be a valuable tool for the future, but it has not been sufficient to combat the present threat of bioweapons.

D. Criminalization

In response to international criticism of the Bush administration's rejection of the inspection protocol for the BWC, it proposed requiring members of the BWC to criminalize the use of

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facilities, centrifuges, freeze drying equipment, and aerosol inhalation chambers. Kellman, *Biological Terrorism*, *supra* note 7, at 458-59.

156. Because anthrax is ubiquitous, the prohibitive step in creating a bioweapon is aerosolization, which would involve milling the particles to the proper size and eliminating electrostatic charges between particles. *Panel II*, *supra* note 74. However, smallpox is one of the few agents that can cause catastrophic damage without sophisticated engineering or delivery. *See* discussion *supra* Part II.A.3.

157. Tell, *supra* note 7, at 29.

158. Charles Seabrook, *Much of World Lax on Bioweapons*, COX NEWS SERV., Oct. 25, 2001 (noting failing marks for China and many former Soviet republics).

159. Englund, *supra* note 61, at 8A (reporting that Russia cancelled the transfer after the sale was exposed).

bioweapons within their borders rather than to submit to international inspections.[160] This was based on the assessment that non-state actors pose the real threat of bioweapons and was thought as the best way to get to such groups. The CWC, when confronted with similar threats as the BWC, has also included criminalization requirements.[161] In assessing the value of criminalization, this section will analyze both current and proposed criminal sanctions. It will evaluate their effectiveness at deterring bioweapons development and preventing the use of such weapons.

1. Current Criminal Laws

United States law currently prohibits the use and possession of bioweapons and carries sanctions of imprisonment in addition to the death penalty.[162] However, there are many problems with these laws. The most important problem is that the laws are ineffective at criminalizing behavior that takes place before the use of bioweapons in an attack.[163] If a person is caught before using bioweapons, then it would be virtually impossible to convict under these laws.[164] For example, neo-nazi Larry Wayne Harris received only six months probation for mail fraud in connection with his mail ordering of plague.[165] When considering the potential irreparable harm associated with a bioweapons attack, it seems ineffectual for criminal sanctions to only apply after such attacks.[166] It is likely that the current Unites States laws would do little to deter the development of bioweapons. Given the philosophies of groups likely

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160. *See* Bill Nichols, *U.S., Europeans Resume Talks on Bioweapons,* USA TODAY, Oct. 23, 2001, at 4A.

161. *See* Kellman, *Catastrophic Terrorism*, *supra* note 48, at 549.

162. *See* 18 U.S.C. §§ 175-178 (2002) (criminalizing known possession or development of a biological agent for use as a weapon); Linkie, *supra* note 105, at 543 (discussing the criminal laws).

163. *See* Kellman, *Catastrophic Terrorism*, *supra* note 48, at 551 (discussing the limitations of the requirement that the biological agents be "for use as a weapon").

164. *See* Kellman, *Biological Terrorism*, *supra* note 7, at 466 (noting that possession of any biological agent without a license would be legal unless the government is able to prove intent to use the agent as a weapon); *but see* United States v. Baker, 98 F.3d 330, 338-39 (8th Cir. 1996) (upholding a conviction under 18 U.S.C. § 175 for actions by defendant prior to an actual attack with ricin).

165. Harris avoided charges under 18 U.S.C. § 175 by claiming he was ordering the plague to conduct defensive research. *See* Kellman, *Biological Terrorism*, *supra* note 7, at 449. 18 U.S.C. § 175(b) (1994) excludes from criminality possession or development of agents for "prophylactic, protective, bona fide research, or other peaceful purpose[s]."

166. President Bush's proposal of expanding the United Nations' ability to investigate suspected bioweapons attacks is likewise nonsensical given the potential damage of a bioweapons attack and the need to take preventative measures. James Gerstenzang, *Tougher Bioweapons Ban Asked; Bush Urges 1972 Pact Be Bolstered in Face of Threat*, CHI. TRIB., Nov. 2, 2001, at 14 (stating President Bush's proposal).

to actually use bioweapons, it would also do nothing to deter the use of such weapons. Even if other states were to accept President Bush's proposal and institute criminal laws in their own territories, there is no reason to believe that enforcement would be any more effective than it is in the United States. In addition, no impact would be made on a state's bioweapons program.

2. Expanded Criminal Laws

Senator Diane Feinstein has proposed to extend United States law to criminalize the possession of certain biological agents.[167] While the biotech industry has expressed some reservations over the potential scope of such laws, it may be possible to define the criminal conduct without infringing upon legitimate research. This would close the loophole in the current United States laws, and may allow federal authorities to take action against non-state actors that represent a bioweapons threat within the United States. However, even if this approach were applied abroad, pursuant to President Bush's proposal, it would still be subject to potentially ineffectual enforcement (intentional or otherwise) by foreign nations and an inability to reach state-based bioweapons programs.

A separate proposal for using criminalization, advocated by the Harvard Sussex Group,[168] is to push for international acceptance of characterizing involvement with bioweapons as a "universal crime."[169] In addition to requiring other nations to criminalize bioweapons, by bringing in any advantage such an approach may afford, it would create many procedural benefits which would allow the United States to combat bioweapons on a worldwide basis.[170] Such an approach may also encourage acceptance of unilateral action in response to a bioweapons threat. This could even allow the United States to target state actors that are pursuing bioweapons. Recent efforts by the United Nations in other areas have shown that this kind of approach could succeed.[171] Despite these potential advantages, the Bush administration has explicitly clarified that its proposed criminalization is not for "universal jurisdiction."[172]

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167. Dagen, *supra* note 146, at 562.

168. *See* Scharf, *supra* note 127, at 506-508 (giving background on the Harvard Sussex Program and explaining its plan).

169. *See* Cecil Hunt, *The Potential Contribution of the Chemical Weapons Convention to Combating Terrorism*, 20 MICH. J. INT'L L. 523, 531-33 (1999) (discussing the adoption of air piracy and hostage taking as universal crimes).

170. *Id.* Benefits include easier extradition, international assistance with enforcement, universal jurisdiction, and renditions.

171. *See* Kellman, *Catastrophic Terrorism*, *supra* note 48, at 555-56 (discussing the United Nations recent decision to make the bombing of public buildings an international crime).

172. Editorial, *Germ War Treaty Redux*, BOSTON GLOBE, Nov. 6, 2001, at A14.

3. Conclusion

Criminalization might be able to reach non-state actors who could avoid an inspection regime. However, the current United States laws have proved ineffective for deterring development or use of bioweapons. Bush's proposal to extend United States-type laws to other nations would likewise be ineffective at reaching non-state actors, and would do nothing to target state bioweapons programs. To make the United States laws effective, they would have to extend to activities prior to the actual use of a bioweapon. However, such laws would still be ineffective internationally because of the potential for ineffective enforcement. Making the use, development, or possession of bioweapons a universal crime would combine any advantages of President Bush's plan with the added ability of the United States to use criminal enforcement against foreign non-state actors and possibly to justify the use of unilateral actions against state actors.

IV. PROPOSALS

"[I]t is not now a question of whether [enforcement measures will be added], but of when and how."

- Tibor Toth, chair of the Geneva talks on reforming the BWC.[173]

"[There is] broad agreement that more work needs to be done to examine measures to strengthen the Biological Weapons Convention."

- Philip Reeker, State Department spokesperson.[174]

A universal agreement in the international community almost exists, so action needs to be taken in order for the BWC to be effective in preventing the development and use of bioweapons. This section will analyze the various proposals that have been advanced. The proposals will be analyzed as to their efficacy in combating the threat of bioweapons from both state and non-state actors.

173. Gavaghan, *supra* note 100, at 29.
174. *Briefing*, *supra* note 101, at 4.

A. BWC Protocol

"[T]he draft protocol would put national security and confidential business information at risk."

- Donald A. Mahley, United States negotiator to the BWC Ad Hoc Group.[175]

The BWC Ad Hoc Group recently presented its draft protocol for an enforcement mechanism for the BWC.[176] Although almost all of the nations that had participated in the negotiations supported the protocol,[177] including the United States' allies in Europe and Asia,[178] the United States completely rejected the proposed protocol, claiming in would be ineffective and unduly intrusive.[179] The central feature of the draft protocol was an inspection regime modeled largely on that used by the CWC.

The criticism, which came almost exclusively from the United States, was based upon a perceived threat to industry, a threat to national security, and ineffectualness. Although the Bush administration has denied that it is opposing the measure solely due to its multilateralism,[180] its declared reasons are largely refuted by an analysis of the proposal. Industry has voiced acceptance of an international inspection regime in addition to the similar CWC inspection regime, which has been shown as not threatening propriety information.[181] Threats to the security of national labs could be likely dealt with by the right to limit the scope of inspections and the right to refuse inspections, similar to those in the CWC. Threats to export controls are a minimal threat if testing is limited to non-viable means. It should not be a major factor when considering the general failure of other more important export controls at regulating trade in either microorganisms or the sophisticated equipment needed to weaponize such agents. Therefore, many of the fears raised by the Bush administration and

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175. Cooper, *supra* note 113, A01.

176. The text of the draft protocol and other releases from the Ad Hoc Group are available on-line, at http://disarmament.un.org/wmd/bwc/index.html (last visited Feb. 17, 2003).

177. Cooper, *supra* note 113, at A01.

178. *Washington Confirms It Will Not Back Germ Warfare Pact Enforcement Draft,* AGENCE FRANCE PRESSE, July 23, 2001.

179. *See* Kralev, *supra* note 63, at A01. The protocol has effectively been abandoned because of the United States' response. *A Biological Imperative,* LOS ANGELES TIMES, Nov. 5, 2001, at 10; *see* Gertstenzang, *supra* note 166.

180. *See State Department Regular Briefing*, FED. NEWS SERV., July 25, 2001; *Briefing, supra* note 101.

181. *See* discussion *supra* Part III.B.2. Barbara Hatch Rosenberg, the head of the FAS, has said that proprietary information could be completely protected. *Marketplace, supra* note 122.

industry groups can be adequately addressed by the structure of the regime.

The lack of efficacy of the draft protocol is a serious issue. Unless vigorous and unannounced inspections are included, it is likely that state programs could avoid detection, although they might be harassed by inspections. Non-state actors might be detectable, but only to the extent that they use legitimate covers or other operations that would be subject to inspection. This might reach the complex operations necessary to develop exotic agents but would likely not reach the small-scale facilities needed for common agents or smallpox. However, acceptance of the protocol would probably not harm the United States, and it might deter the development of bioweapons on balance. Therefore, the protocol has the potential to help combat the threat of bioweapons, and does not appear to likely cause any great harm.

B. Bush Proposal

"Ironically . . . Bush this summer renounced long-standing calls for the creation of such a mechanism for bioweapons."

- Andrew Jack, *Extent of Russian Bioweapons Programme Generates Fear*, Fin. Times (London), Oct. 26, 2001.

"[It is] ironical [sic] that partially U.S. has been responsible [for blocking enforcement mechanisms]."

- Bioweapons: a Potential Threat of Mass Destruction, THE HINDU (India), Oct. 23, 2001, at 2001 WL 28477849.

"Efforts to build a tough verification protocol to the 1972 BWC have been blocked for years, ironically, by the US."

- Richard Ingham, *Miracle of Biotech Could Also Breed a Monster*, AGENCE FR. PRESSE, Oct. 23, 2001.

Three months after rejecting the draft protocol, and in the wake of anthrax attacks on United States soil, the Bush administration proposed an alternative to the BWC protocol.[182] The heart of the

182. The Bush administration has denied that its proposal was motivated by the recent anthrax attacks, claiming it always intended to propose an alternative. Nichols, *supra* note

Bush proposal is for all countries to criminalize the use, production, importation, and exportation of bioweapons.[183] President Bush has also advocated expansion of the ability of the United Nations to investigate suspected bioweapons attacks and to develop an ethical code of conduct for biological scientists.[184] As the analysis above indicates, these measures would have little effect on the development or use of bioweapons by either state or non-state actors. Despite repeated requests by Congressional committees, the administration's representative to the BWC negotiations has refused to provide the reasons for the administration's rejection of the protocol or advocacy for its proposals.[185] It appears that the Bush proposal would not greatly aid the fight against bioweapons.

It addition to not helping the efforts to discourage bioweapons, the Bush administration's proposals may actually hurt such efforts by preventing transparency. Many scientists working for the Soviet bioweapons program felt justified in doing so, because they believed the United States was pursuing a similar program.[186] Such a belief continues to be an issue in the world community,[187] fueled by reports that the United States is pursuing offensive bioweapons programs.[188] The above-mentioned quotes from various foreign media sources demonstrate the surprise that the world community has experienced toward the Bush administration's position. It has frequently been attributed to either a general dislike of multilateral actions or to the desire to conceal an offensive bioweapons program. Both of these accusations hinder the ability of the United States to address the worldwide threat of bioweapons, and the latter may encourage development of such weapons by other countries. Combined with the inefficacy of the proposed actions, these reasons make the Bush approach an unviable option for combating the threat of bioweapons. History has unfortunately shown that the

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140; Kralev, *supra* note 63, at A17. In fairness to the current administration, the Clinton administration also failed to identify multilateral action as a key component of responding to the threat of bioweapons. Michael McCarthy, *USA Plans Major Effort to Counter Biowarfare*, THE LANCET, May 30, 1998, at 1641 (reporting on a speech in which Clinton cited four factors for addressing the threat of bioweapons, none of which was a multilateral solution).

183. *See* Nichols, *supra* note 160, at 4A.

184. *See* Gerstenzang, *supra* note 166.

185. *Hearings*, *supra* note 3 (remarks of Rep. Christopher Shays, chairman of the House subcommittee on National Security, Veterans Affairs and International Relations).

186. *See* Miller et al., *Revelation*, *supra* note 41, at A1.

187. *See* Cohen, *supra* note 98.

188. *See, e.g.*, Judith Miller et al., *U.S. Germ Warfare Research Pushes Treaty Limits*, NEW YORK TIMES, Sept. 4, 2001, at A1 [hereinafter Miller et al., *Germ Warfare*] (describing "defensive" research which includes engineering more virulent strains of anthrax and which has been characterized by many experts as a violation of the BWC).

United States often responds to biological threats only after catastrophes.[189]

C. Harvard Sussex Plan

Although it has received much less attention than the previous two plans, the Harvard Sussex Plan[190] centers around a unique form of criminalization. In addition to requiring countries to adopt their own criminal laws, the plan would require acknowledgement of bioweapons crimes as universal jurisdiction offenses. This would create international law obligations not only to adopt criminal laws, but also to vigorously enforce them.[191] Also, all covered offenses would also be extraditable, and there would be a duty to assist other nations in the enforcement of their laws.[192] Universal criminality may also justify extraterritorial jurisdiction of United States enforcement efforts. In contrast to the Bush plan, this type of criminalization might actually reach non-state actors and prevent their development and use of bioweapons. Possession of bioweapon agents would be one of the included crimes, which is not covered by the Bush plan.

In addition to these benefits, the plan might encourage acceptance of unilateral actions in response to either a state actor's or non-state actor's use or development of bioweapons. Actions such as the United States' strike on the alleged weapons factory in Sudan might be seen as justified and even accepted as legitimate uses of force.[193] While such a result would not necessarily follow widespread acceptance of the Harvard Sussex Plan, acceptance of bioweapons crimes as a universal jurisdiction offense would further this argument, and there is evidence that much of the world would not be distressed by such actions.[194]

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189. Victoria V. Sutton, *A Precarious "Hot Zone"- The President's Plan to Combat Bioterrorism*, 164 MIL. L. REV. 135, 154 (2000) (stating that "the Biologics Act of 1906 was a response to the death of several children due to a vaccine infected with tetanus; The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 was a result of the Love Canal environmental disaster; and the Emergency Planning and Community Right-to-Know Act of 1986 was a result of the Bhopal disaster.").

190. Scharf, *supra* note 127, at 506 (stating that "[t]he Harvard Sussex Program on Chemical and Biological Warfare Armament and Arms Limitation has proposed a 'Convention on the Prevention and Punishment of the Crime of Developing, Producing, Acquiring, Stockpiling, Retaining, Transferring or Using Biological or Chemical Weapons'"). The Harvard Sussex plan has been vigorously advocated in the United States by Matthew Meselson, a Harvard University molecular geneticist. *Bioweapons, supra* note 2.

191. Scharf, *supra* note 127, at 506.

192. *Id.*

193. *Id.* at 494 (noting that a negative public reaction did not occur until evidence emerged that the factory was not involved in chemical or biological weapons, suggesting much of the world would already accept unilateral military action in the face of a bioweapons threat).

194. *Id.* at 494-95.

V. CONCLUSION

Biological weapons represent a significant threat to the security and welfare of the United States and the world in general. An estimated twelve states have existing bioweapons programs, which include weaponized forms of the most dangerous agents such as smallpox. A release of these agents, or an attack with such weapons, would lead to devastating results. However, it appears that such weapons could be used by states in a conceptually similar manner as nuclear weapons, either as a strategic asset for international diplomacy or as a deterrent against other weapons of mass destruction. History has taught harsh lessons that battlefield use of such weapons is not effective and could have dire and unforeseen effects.

Non-state actors represent a different threat than states. Other than religious terrorists, most groups would not attempt to develop or desire to use such weapons. The religious terrorist groups that have tried to acquire and weaponize biological agents have also failed to achieve the capabilities they have desired. Although a potential exists for the transfer of agents from state to non-state actors, it is likely that non-state groups would be limited in their ability to obtain agents other than the more common pathogens such as anthrax or plague. Without the sophisticated facilities to process or weaponize such agents, it is currently unlikely that such a group could cause any greater harm with biological agents than it could with conventional weapons.

Three types of solutions have been proposed in the face of these two threats. First, an inspection regime may be somewhat effective against state actors but would be less effective against non-state groups. If non-challenge visits could be performed without significant notice, it may be possible to discover or deter the use of large facilities for bioweapons development. While this may not prohibit state-based bioweapons, it would raise the costs of developing them. Even if it did not hinder state programs, it might encourage transparency and reduce the perceived needs for the development of bioweapons. An inspection regime may also reach non-state groups that were using legitimate facilities as covers for their operations. By discouraging state programs, it would also minimize the risk of transfers from states to non-state actors. Concerns over national security and confidential information being compromised by an inspection regime are overstated, and the benefits of a well-designed program should outweigh the costs.

Restrictions on equipment have failed so far to be a barrier to bioweapons development, but they may serve a role in the future. It is impossible to limit access to many of the common agents that

would be used in bioweapons because they are ubiquitous in the environment. Restrictions on the equipment needed to weaponize such agents have the potential to thwart the development of bioweapons. Many experts believe engineering issues are the prohibitive step in weaponizing biological agents. Despite the efforts of the Australia Group, sales of this type of equipment continue. Even if these restrictions were effective in combating the development of bioweapons by non-state actors, they would likely do little to inhibit a state from bringing its resources to bear on such development.

Absent universal jurisdiction, criminalization would likely do little to combat the threat of bioweapons. Current United States criminalization has proved largely ineffective, therefore little would be gained from other states' adoption of similar measures. Even if harsher measures were advocated, enforcement in other states may be ineffectual, possibly intentionally so. There is the potential for international support for the classification of bioweapons offenses as universal crimes leading to universal jurisdiction and other mechanisms for enhanced prosecution. This may allow effective criminalization of the offenses and also potentially lead to acceptance of unilateral actions in response to the threat of bioweapons.

There have been three proposed sets of actions to the threat of bioweapons. The BWC Ad Hoc Group has proposed a draft protocol for an inspection regime. Such a regime would likely discourage state-based programs, encourage transparency, and may inhibit non-state actors. The Bush administration's proposal centers around encouraging non-universal criminalization and support for the Australia Group's restrictions on sales of equipment. This would likely have little effect on state-based programs, but the restriction on equipment, if effective, may hamper non-state actors. The Harvard Sussex Program, which has advocated universal criminalization, would be more effective in reaching non-state actors than Bush's plan which also advocates for criminalization. Although it would not directly get to state-based programs, it could potentially lead to international norms against bioweapons and acceptance of unilateral actions against those who are developing bioweapons.

None of the three proposals would be wholly effective at combating the threat of bioweapons. Inspections would offer some discouragement of state-programs through fear of detection, increased costs, and decreased motivation to develop bioweapons due to transparency. Additionally, equipment restrictions and universal criminalization may inhibit non-state actors in their quest to develop effective bioweapons. The use of all three approaches—

international inspections, universal criminalization, and equipment restrictions—is necessary to seriously combat the threat of bioweapons. Therefore, the ideal response would be to combine the CWC-type inspection regime from the BWC protocol with an expanded Australia Group-type restriction on equipment and a Harvard Sussex-type universal criminalization.

The potentially catastrophic consequences of bioweapons demand a comprehensive response to this threat. Access to biological agents and equipment, detection of bioweapon facilities, and universal criminalization of possession and development of bioweapons are all needed to adequately combat the proliferation and utilization of biological weapons.