



BIOSECURITY COMMONS REVIEW

DEVELOPMENTS, TRENDS & ISSUES FOR THE YEAR ENDING MAY 2011

ANNUAL EDITION

Invited Authors

Topic

Derrin Culp
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THE NUCLEAR POSTURE REVIEW
BOTULINUM NEUROTOXIN

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ANTHRAX, PSI
ANTHRAX
BOTULINUM NEUROTOXIN
ANTHRAX, PSI

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--With special thanks to our invited authors, Derrin Culp and Patrick McNutt, for valued contributions to the Review and important contributions to the field.

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EXECUTIVE SUMMARY

The second annual edition of the *Review* identified key issues in biosecurity and reflected upon policies related to important developments for the year ending May 2011. The *Review* added an exciting new feature for the second annual edition with the invitation of two expert authors to address current issues in their area of expertise.

Invited author Derrin Culp from the National Center for Disaster Preparedness, Mailman School of Public Health, Columbia University, examines U.S. policy and the use of nuclear deterrence with regard to the threat of bio-weapons. The analysis of U.S. policy raises many interesting questions including the nexus between deterrence and non-state actors. Invited author Patrick McNutt from the US Army Medical Research Institute of Chemical Defense, APG, MD, along with staff BsC researcher, Jonathan Farzanfar help bring context to the dangers presented by the malicious use of botulinum neurotoxin (BoNT) and add insights to the severity of the threat.

In this connection, the *Review* employed a new editorial concept for the first time in the BoNT report called a, “Negative-Information Security Cite,” (NISC). A NISC is used within the report as a protocol that offers a good faith declaration by the author that open source information is available but unidentified in the article due to security concerns. Authors and editors have a duty to substantiate facts upon which debate and analysis rely, but they also have a duty to mitigate the detrimental effects of their scholarship. The growing body of national security literature demands a reliable good faith mechanism to uniformly address this security concern. Thus a NISC citation within the *Biosecurity Commons Review* indicates that the information referred to exists, but it is withheld and on file with the author or editor as indicated. Authors addressing security issues routinely face the dilemma of advancing knowledge within the field against contributing to the risk they are trying to mitigate. The NISC helps codify this norm and enables further development of this concept.

BsC staff contributed additional chapters on Anthrax and the Proliferation Security Initiative (PSI). Many important developments unfolded for both topics over the past year. In addition to advancements in the scientific literature, new developments in the Amerithrax investigation may have provided sufficient evidence to bring closure to years of controversy over attribution of the 2001 anthrax attacks. Finally, examination of the policy and progress of the PSI provided an opportunity to clarify some confusion in the literature, reflect upon the strategies behind the initiative, and relate these strategies to the recent PSI success with the *M/V Light*.

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1 Anthrax: The Threat, Treatments, Response & Controversy

Brian J. Gorman, Steven DeSena, Matthew Burch

1. Introduction. Anthrax is a virulent disease that has been the focus of much attention since the anthrax attacks of 2001. The attacks occurred between October 4 and November 20, 2001 and resulted in 22 cases of anthrax, with 5 fatalities.¹ The anthrax attacks and the notorious terrorist attacks a few weeks earlier on 9-11 were transformative events which brought critical assessment of security issues to the fore across society. A poll taken during the anthrax attacks revealed that the majority of U.S. citizens were critical of the federal government's preparation and response to the attacks.² Controversy over anthrax continues to this day, nearly a decade later. The investigation into the attacks, known as the "Amerithrax Investigation," did come to a conclusion with the identification of Bruce Ivins as the suspect. The controversy lingers,³ however, due in part to a lack of judicial closure given the pre-indictment suicide of Bruce Ivins. Some lingering controversy is perhaps unavoidable in the absence of judicial closure, but the fact that anthrax is widely regarded as one of the most problematic bioterrorism threats⁴ affirms the importance of resolving the controversy surrounding Amerithrax to the greatest extent possible.

2. The Anthrax Threat. Anthrax scores highly on key bioweapon attributes such as virulence, time to disease, and susceptibility of possible target populations.⁵ In addition, anthrax is extremely hardy in the environment.⁶ Thus, expert attempts at mitigating harm from an anthrax

¹ Daniel B. Jernigan, et al., *Investigation of Bioterrorism-Related Anthrax, United States, 2001: Epidemiologic Findings*, EMERGING INFECTIOUS DISEASES, Oct 2002, at 1019. Available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2730292/pdf/02-0353_FinalR.pdf

² A poll administered during the attacks in October 2001 indicated that 53.1% of U.S. citizens believed that the federal government did not do enough to prepare for bioterrorism and/or respond to the 2001 attacks. The CBS News/New York Times ANTHRAX POLL #2, October 2001 (Computer File). ICPSR version. Horsham, PA: Taylor Nelson Sofres Intersearch [producer] 2001. Ann Arbor, MI: Inter-University Consortium for Political and Social Research [distributor], 2002.

³ Noah Shachtman, *Anthrax Redux: Did the Feds Nab the Wrong Guy?*, WIRED, March 24, 2011, http://www.wired.com/magazine/2011/03/ff_anthrax_fbi/. Saathoff, Gregory et al., Report of the Expert Behavioral Panel, See FBI March 23, 2011 press release, <http://www.fbi.gov/news/pressrel/press-releases/fbi-response-to-report-by-independent-expert-behavioral-analysis-panel-on-2001-anthrax-letters>.

⁴ Nidhi Bouri, Crystal Franco, *Environmental Decontamination Following a Large-Scale Bioterrorism Attack: Federal Progress and Remaining Gaps*, BIOSECURITY AND BIOTERRORISM: BIODEFENSE STRATEGY, PRACTICE, AND SCIENCE, Vol. 8, No. 2, 2010. April 7, 2010. "Bacillus anthracis, the causative agent of anthrax, is considered to be the most problematic agent of concern."

⁵ Arturo Casadevall, Liise-Anne Pirofski, *The Weapon Potential of a Microbe*, TRENDS IN MICROBIOLOGY, Vol. 12, No. 6, June 2004.

⁶ See *supra* note 4.

attack remain an elusive task, even in a controlled experimental setting.⁷ Those who come in contact with anthrax without treatment suffer a death rate in excess of 99 percent.⁸ Fortunately, however, medical treatment can be highly effective, but those exposed must be treated within 48 hours of infection.⁹ Tens of thousands of antibiotic treatments were deployed after the attacks in 2001.¹⁰ The 2001 attacks demonstrated how the government must be prepared to respond rapidly on a large scale in order to be prepared for another attack.

Unfortunately, the Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism in their *World at Risk* report of 2008 maintained that another terrorist attack is imminent somewhere in the world and that the U.S. remains vulnerable and needs to be better prepared to deal with such an attack.¹¹ While the threat identified in the report remains, notable developments and trends since the 2008 report speaking to vulnerability and preparedness for an anthrax attack are addressed within.

3. Treatments.

A. Pre-Exposure Prophylaxis and Post-Exposure Treatment.

Medical interventions for anthrax consist of a pre-exposure vaccine which creates immunities and post-exposure treatment of antibiotics, i.e. ciprofloxacin, doxycycline or amoxicillin for 60 days.¹²

1. Use & Limitations of Vaccine. Use of the anthrax vaccine in the U.S. is limited mostly to members of the military serving in high-risk areas and biosecurity personnel serving in

⁷ Bill Kuomikakis, et al., *Anthrax Letters: Personal Exposure, Building Contamination, and Effectiveness of Immediate Mitigation Measures*, JOURNAL OF OCCUPATIONAL AND ENVIRONMENTAL HYGIENE, 7:2, 71-79. First Published on December 15, 2009. "A study employing various mitigation procedures in response to a simulated anthrax attack from letter release in an actual office building found that spores spread quickly and that it would be difficult to devise a quick response protocol to prevent the spread of anthrax spores."

⁸ Elaine Pittman, *Letter Carriers Add Bioterror Response to the Postal Service*" EMERGENCY MANAGEMENT, November 16, 2010. Available at <http://www.emergencymgmt.com/health/Letter-Carriers-Add-Bioterror-Response-to-the-Postal-Service.html>. Last Checked November 22, 2010.

⁹ *Id.*

¹⁰ *See supra* note 1. "Antimicrobial postexposure prophylaxis was recommended for persons at risk for inhalational anthrax ... An estimated 32,000 persons initiated antimicrobial prophylaxis; however, completion of a 60-day course of antimicrobial prophylaxis was recommended for approximately 10,300 persons." P. 1025

¹¹ Bob Graham, et. al., *WORLD AT RISK: THE REPORT OF THE COMMISSION FOR THE PREVENTION OF WEAPONS OF MASS DESTRUCTION PROLIFERATION AND TERRORISM*, 2008. "The Commission believes that unless the world community acts decisively and with great urgency, it is more likely than not that a weapon of mass destruction will be used in a terrorist attack somewhere in the world by the end of 2013. ... that terrorists are more likely to be able to obtain and use a biological weapon than a nuclear weapon. ... that the U.S. government needs to move more aggressively to limit the proliferation of biological weapons and reduce the prospect of a bioterror attack" p. XV.

¹² S. Ramasamy, et al., *Principles of antidote pharmacology: an update on prophylaxis, post-exposure treatment recommendations and research initiatives for biological agents*, BRITISH JOURNAL OF PHARMACOLOGY, April 20, 2010 "Antibiotics are still recommended as the mainstay treatment following exposure to anthrax."

the homeland.¹³ The vaccine creates temporary immunity and requires 5 injections over 18 months to sustain immunity.¹⁴ The vaccine also has known drawbacks.¹⁵ For instance, one in five vaccine recipients develop redness, swelling or pain at the injection site, and a small number develop severe allergic reactions.¹⁶ In addition, a review found a small correlation between administration of the vaccine in the first trimester and birth defects in newborns.¹⁷

B. Anthrax Vaccine Developments. A number of studies claim to improve upon the anthrax vaccine. For instance, researchers at Albert Einstein College of Medicine of Yeshiva University claimed to have made a discovery that could lead to a vaccine with fewer side effects compared to the current vaccine.¹⁸ In like manner, Gaobing et al. recently claimed to have developed a novel and dually functional reagent for the prophylaxis and treatment of anthrax.¹⁹

Researchers have created a dual vaccine against anthrax and smallpox which is allegedly more effective than the extant vaccines.²⁰ The breakthrough came through the addition of interleukin-15 to the smallpox vaccine and the addition of one protein from anthrax bacteria.²¹ Researchers also assert that the dual vaccine can be freeze-dried²² which could help streamline the manufacture, stockpiling, and swift deployment of such vaccines.²³ In this connection, the

¹³ Editors, *Scientists Closer to a Safer Anthrax Vaccine*, HOMELAND SECURITY NEWSWIRE, Sept. 4, 2010 [29] Last accessed Oct. 21, 2010; Jordan, Bryant, *Airmen Given Expired Anthrax Vaccines*, MILITARY.COM, NEWS, [33], Oct. 28, 2010, Last Checked Nov. 3, 2010 "the Anthrax Vaccine Immunization Program, or AVIP, requires troops assigned to high-threat areas to be inoculated against a potential infection."

¹⁴ Editors, *Scientists Closer to a Safer Anthrax Vaccine*, HOMELAND SECURITY NEWSWIRE, Sept. 4, 2010 [29] Last accessed Oct. 21, 2010.

¹⁵ Spencer Hsu, *Modest Gains Against Ever-Present Bioterrorism Threat; An Attack Could Be Hard To Predict With Current Tools*, WASHINGTON POST, A10, Aug 3, 2008. "The government has not developed a general-use anthrax vaccine."

¹⁶ See *supra* note 14.

¹⁷ Margaret A. K., Ryan, et al. *Birth Defects among Infants Born to Women Who Received Anthrax Vaccine in Pregnancy*, AMERICAN JOURNAL OF EPIDEMIOLOGY Aug 15, 2008 434.

¹⁸ See *supra* note 14.

¹⁹ Gaobing Wu, et. al., *A Chimeric Protein that Functions as both an Anthrax Dual-Target Antitoxin and a Trivalent Vaccine*, JOURNAL, ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, Vol. 54, No. 1, pp. 4750-4757, November 2010. "Mice immunized with LFn-DPA tolerated a LeTx challenge that was 5 times its 50% lethal does. Thus, LFn-DPA represents a highly effective trivalent vaccine candidate for both pre-exposure and post-exposure vaccination."

²⁰ Todd Merkel, et. al., *Development of a highly efficacious vaccinia-based dual vaccine against smallpox and anthrax, two important bioterror entities*, PNAS, Sept. 2, 2010. "It is important to emphasize that the vaccinia-based dual vaccine with integrated IL-15 not only is superior in immunogenicity and efficacy in comparison with the currently licensed vaccines against smallpox and anthrax, but also remedies the inadequacies associated with such licensed vaccines."

²¹ Maggie Fox, *Researchers combine smallpox, anthrax vaccines*, REUTERS, HEALTH AND SCIENCE, UK, Oct. 4, 2010. [21] Last Checked October 5, 2010.

²² *Id.*

²³ See *supra* note 20 .

recent discovery of the administration of expired anthrax vaccine in the military speaks to the benefits of an effective vaccine that can be stored for extended periods of time.²⁴

1. Valortim. The biodefense company PharmAthene recently argued that its anthrax anti-toxin Valortim®, which is being developed for inhalation anthrax should be added to the national stockpile once their findings are confirmed.²⁵ According to PharmAthene, “Preclinical studies suggest that Valortim® has the potential to provide protection against anthrax infection when administered prophylactically ... and also may increase survival when administered therapeutically (once symptoms become evident).”²⁶ Findings suggest that, “Valortim® appears to augment the immune system's ability to kill anthrax bacilli by enhancing the human dendritic cell response to a challenge with anthrax spores.”²⁷

4. Emergency Response to Anthrax. Broadly speaking emergency response to anthrax can be divided between therapeutic and environmental responses. Therapeutic responses consist of medications and the means of delivery while environmental response involves: 1.) Sampling, Testing, and Analysis; 2.) Containment and Mitigation; 3.) Decontamination, Confirmatory Sampling, and Testing.²⁸

A. The Strategic National Stockpile. The Strategic National Stockpile (SNS),²⁹ an emergency cache of critical pharmaceuticals that can be sent within 12 hours to counter outbreaks, has been greatly expanded.³⁰ Reporting from 2008 indicates that the stockpile has upwards of 300 million doses of smallpox vaccine, 60 million treatment courses of antibiotics for anthrax and pneumonic plague.³¹ In July 2010, a European pharmaceutical company announced that it delivered 1 million doses of a smallpox vaccine for the SNS called IMVAMUNE®.³² The vaccine is targeted specifically for 25% of the population that may be immunocompromised and others for whom the standard vaccine with a replicating form of the vaccinia virus is

²⁴ Bryant Jordan, *Airmen Given Expired Anthrax Vaccines*, MILITARY.COM, [33], Oct. 28, 2010, Last Checked Nov. 3, 2010. “All Air Force medical facilities stopped vaccinating against anthrax on Oct. 26 after officials determined that many treatment centers administered expired vaccines earlier in the same month.”

²⁵ PharmAthene, Inc., *Data Show Valortim(R) Anthrax Anti-Toxin May Augment Immune System's Ability to Destroy Anthrax Bacteria*, [5], PR Newswire, February 24, 2010.

²⁶ *Id.*

²⁷ *Id.*

²⁸ *See supra* note 4.

²⁹ *See generally* CDC at <http://www.cdc.gov/phpr/stockpile.htm> Last checked June 14, 2011.

³⁰ *See supra* note 15.

³¹ *Id.* “The government has not developed a general-use anthrax vaccine.”

³² Editors, *Bavarian Nordic Delivers 1 Million Doses of First Vaccine Developed Under U.S. Biopreparedness Program to the Strategic National Stockpile*, THERAPEUTICS DAILY, July 13, 2010. Available at <http://www.therapeuticsdaily.com/news/article.cfm?contentValue=716921&contentType=newsarchive&channelID=28>. Last checked June 14, 2011.

contraindicated.³³ IMVAMUNE eliminates the risk of accidental infection by using a non-replicating strain of vaccinia virus that does not have the ability to replicate in human cells.³⁴

1. Distribution. According to recent plans, state and local health departments will set up mass dispensing sites to distribute medication from the Strategic National Stockpile to people who may have been infected.³⁵ The United States Postal Service will also compliment existing plans by providing designated recipients with a 20 pill supply.³⁶

B. Delivery of Medical Countermeasures. President Obama recently put the U.S. Postal Service (USPS) in charge of delivering medical aid supplies to civilians in response to a major act of bioterrorism.³⁷ The President also ordered federal law enforcement to support local law enforcement in providing escorts for postal workers making such deliveries.³⁸ This strategy, however, must take into consideration the changing nature of the USPS in the information society. Any plans relying on the USPS network must be made with a view toward the future capacity of the USPS.³⁹

C. Decontamination. Decontamination is the process of removing or inactivating a hazardous substance (in this case, a biological agent) from contaminated environments or surfaces, including skin, clothing, buildings, air, and water, in order to prevent adverse health events from occurring.⁴⁰

Critics have argued that the federal government is not adequately prepared for anthrax decontamination. The complaint is that federal plans do not sufficiently delineate decontamination leadership roles and responsibilities despite the fact that numerous federal agencies have responsibility for portions of the decontamination response from a bioterrorism attack.⁴¹ Decontamination is very costly and failure to respond quickly leads to sustained disruption of economic activity. It is estimated that the cost of decontamination following the

³³ *Id.*

³⁴ *Id.*

³⁵ *See supra* note 8.

³⁶ *Id.*

³⁷ Nick Rees, *U.S. Postal Service to be in charge of drug delivery in the event of a bioattack*, BIOPREPWATCH.COM, Dec. 31, 2009.

³⁸ *Id.*

³⁹ Emily Stephenson, *Postal Service to cut 7,500 jobs, close offices*, REUTERS, “The U.S. Postal Service said on Thursday it would cut 7,500 jobs and close seven district offices and 2,000 post offices as it handles less mail and faces greater staff costs and competition from FedEx and United Parcel Service.” Available at: http://www.msnbc.msn.com/id/42256357/ns/business-us_business/?GT1=43001. Last checked 3/25/2011.

⁴⁰ *See supra* note 4.

⁴¹ *Id.*

2001 anthrax attacks ran upwards of hundreds of millions of dollars, and some facilities were closed for more than 2 years.⁴²

1. Decontamination Agents.

a. Decontamination for Skin Exposure and Surface Decontamination. A survey during the 2001 anthrax attacks found that 25.1% of respondents took special precautions while handling household mail such as washing hands after handling mail.⁴³ Merely washing hands with soap and water, however, is not sufficient to remove anthrax if exposed. Popular waterless rubs containing ethyl alcohol are also inadequate at removing anthrax.⁴⁴ It has been found that hand washing with soap and water containing, 2% chlorhexidine gluconate, or chlorinated towels can reduce the amount of *B. atrophaeus* spore contamination.⁴⁵ Otherwise, surfaces can be effectively decontaminated with 10% bleach solution.⁴⁶

b. Decontamination of the Water Supply. Although it has been argued that a release of anthrax into the public water system would be diluted across the whole system, researchers have found that Dichlor, a swimming pool treatment, proved to be 100 percent effective as an anthrax decontaminant based upon its safety profile and ability to degrade into non-toxic products.⁴⁷

5. The Amerithrax Investigation Controversy. The Amerithrax investigation is controversial for several reasons. Chief among these reasons is that it lacks the vindication of a successful criminal proceeding since the accused, Bruce Ivins, committed suicide just days before he was to be indicted for the attacks.⁴⁸ Other factors contribute to the controversy as well, including the skepticism of the scientific community over the conclusion that Ivins perpetrated the crimes,⁴⁹ coworkers' belief in Ivins' innocence,⁵⁰ and the harmful leaks against an innocent suspect that led to a multi-million dollar settlement with the government.⁵¹

⁴² *Id.*

⁴³ ABC/Washington Post Poll #2, October 2001 (Computer File). ICPSR version 3320). Horsham, PA: Taylor Nelson Sofres Intersearch [producer] 2001. Ann Arbor, MI: Inter-University Consortium for Political and Social Research [distributor], 2002.

⁴⁴ David J. Weber, et al., *Efficacy of Selected Hand Hygiene Agents Used to Remove Bacillus atrophaeus (a Surrogate of bacillus anthracis) From contaminated hands*. JAMA, Mar. 12, 2003, no 10, pg. 1274-1277.

⁴⁵ *Id.*

⁴⁶ Bill Kuomikakis, et al., *Anthrax Letters: Personal Exposure, Building Contamination, and Effectiveness of Immediate Mitigation Measures*, JOURNAL OF OCCUPATIONAL AND ENVIRONMENTAL HYGIENE, 7:2, 71-79. Dec. 15, 2009.

⁴⁷ Pat Dulnier, *Pool chemical could be effective at cleaning anthrax-tainted water supplies*, BIOPREPWATCH.COM, Oct. 4, 2010, [22]. Last Checked Oct. 6, 2010.

⁴⁸ Gregory D. Koblentz, Jonathan B. Tucker, *Tracing an Attack: The Promise of Microbial Forensics*, SURVIVAL, February 2010, p. 161.

⁴⁹ Joby Warrick, et al., *'Scientists Question FBI Probe on Anthrax'*, WASHINGTON POST, 3 August 2008, p. A1.

⁵⁰ *Id.*

⁵¹ See *supra* note 48 at 161.

A question remains whether the reputation of the Amerithrax investigation recovered from the days when it was openly regarded as a “botched investigation.”⁵² The notoriously rocky relationship between law enforcement put the FBI at a disadvantage from the outset in persuading the scientific community that one of their own, a highly regarded microbiologist, was responsible for the anthrax attacks.⁵³ The scientific community, however, had an opportunity to judge the investigation by review of a panel assembled by the National Academy of Sciences (NAS). The NAS report begrudgingly supported the results of the investigation while leaving the door open for critics. The NAS report said that the FBI’s evidence is consistent with and supports an association between Dr. Ivins’s flask and the anthrax attack, but also added doubt by stating that genetic analysis did not definitely demonstrate that the anthrax spores were grown from a sample taken from Dr. Ivins’s laboratory at Fort Detrick.⁵⁴ The open door to criticism of the report appears to be attributed to at least two factors. First it can be argued that the NAS panel was reluctant to act as de facto judge and jury against one of their own who could not speak for himself. Second, it appears that the scientific panel held the evidentiary standard of their review to an empirically significant standard rather than beyond a reasonable doubt standard used in criminal court proceedings.

The controversy over the investigation may yet linger, but the most recent report conducted by a panel assembled by order of the United States District Court for the District of Columbia adds more compelling evidence against Ivins. The Report of the Expert Behavioral Analysis Panel, is partially redacted, but it still helps make the case against Ivins that the FBI could not make publicly. The report said,

The Panel’s review of the sealed psychiatric records, however, does support the Department of Justice’s determination that he [Ivins] was responsible. Dr. Ivins was psychologically disposed to undertake the mailings; his behavioral history demonstrated his potential for carrying them out; and he had the motivation and the means. The psychiatric records offer considerable additional circumstantial evidence in support of the DOJ’s finding.⁵⁵

The report was released not long before the writing of the instant review and no criticisms of the report were observed as of this writing.

⁵² Rush Holt, Rep. U.S. Congress, Letter, NEW YORK TIMES, Mar. 1, 2011. “Recently, I reintroduced legislation to create an independent commission modeled after the 9/11 Commission to review the entire episode: the attacks, the response, the botched investigation and, ultimately, to determine whether our nation is prepared to deal with a biological attack in the future.” http://www.nytimes.com/2011/03/02/opinion/1web02anthrax.html?_r=1 last checked 5/20/2011.

⁵³ Brian J. Gorman, “Balancing National Security and Open Science: A Proposal for Due Process Vetting,” Yale Journal of Law and Technology, 2004-2005, “Unfortunately, the relationship between the scientific community and the U.S. government has deteriorated steadily since the terrorist attacks of 2001.” P. 499.

⁵⁴ Scott Shane, *Expert Panel Is Critical of F.B.I. Work in Investigating Anthrax Letters*, Feb. 15, 2011. Available at http://www.nytimes.com/2011/02/16/us/16anthrax.html?_r=1&ref=science, last checked Feb. 16, 2011.

⁵⁵ Gregory Saathoff et al., REPORT OF THE EXPERT BEHAVIORAL ANALYSIS PANEL, 2011. <https://www.researchstrategiesnetwork.org/pages/view/Amerithrax/> Last checked June 14, 2011.

2 Botulinum Neurotoxin as a Terrorist Weapon: is there Fact behind the Fear?

Patrick McNutt, PhD* and Jonathan Farzanfar, BS**⁵⁶

*“Paralyzed force, gesture without motion”
-The Hollow Men (1925), Thomas Stearns Eliot*

1. Introduction. The flaccid paralysis caused by ingestion of botulinum neurotoxin (BoNT) was first described as “sausage poisoning” in 1820 and attributed to a bacterium in 1897 [1]. We now know that the toxin is a protein produced by *Clostridium botulinum* and currently comes in seven different serotypes designated /A to /G (e.g., BoNT/A represents the toxin produced by *C. botulinum* serotype A). Although the serotypes exhibit different host ranges and cellular targets, intoxication of susceptible hosts invariably results in neuromuscular paralysis.

The same characteristics that make the BoNTs the most lethal substances known (persistence *in vivo*, exceedingly high potency, ease of use and ease of production) also renders the toxin an effective pharmaceutical for a broad range of therapeutic and cosmetic uses [2-3]. BOTOX® (the brand name for the most common BoNT preparation) and its competitors are projected to net \$1.5 to \$2 billion in 2011 sales of cosmetic and therapeutic products [4]. The rapidly increasing list of off-label therapeutic uses for the toxin is contributing to the expanding number of black market BoNT producers, which in turn raises the risk that technologies for synthesis, purification and distribution could be utilized to support political or economic terrorism [5]. Although the total amount of toxin in a clinical preparation for cosmetic use is less than 1% of the dose necessary to kill a single person, production processes are effectively the same for bulk toxin and clinical grade toxin. In 2010, the Washington Post reported that an unlicensed purveyor of concentrated toxin was identified in Russia [6]. Although the man escaped and the (alleged) Chechnyan producer of that particular lot of toxin was apparently not located, the Post reported that US officials believed that “dozens of labs” located in Europe and Asia are supplying an expanding black market for BoNT (these estimates are consistent with a 2010 report commissioned by the DOD Defense Threat Reduction Agency [7]). As the article notes, “[BoNT] is the only profit-making venture for terrorists that can also potentially yield a weapon of mass destruction.” Since BoNT is both a unique and valuable therapeutic drug as well as a highly potent weapon, the toxin is currently the only true “dual-use” select agent. The purpose of this report is to provide context as to the dangers presented by malicious use of BoNT.

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2. BoNT Structure and Cellular Mechanism of Action. The BoNTs are relatively large heterodimeric proteins, comprised of a 50 kiloDalton (kDa) light chain (LC) and a 100 kDa heavy chain (HC). The LC is responsible for intracellular enzymatic activity, and the HC provides neuron-specific targeting and acts as a vehicle to transport the LC into the presynaptic compartment. Since BoNTs cannot penetrate the skin, the toxin must be internalized by ingestion, inhalation or injection to be dangerous. There are several “natural” ways to contract botulinum poisoning:

- Ingestion of preformed toxin, for example, by ingestion of foods in which spores have germinated under anaerobic conditions (typically home-canned; fermented, uncooked; or improperly cooked dishes);
- Ingestion of spores, which in turn colonize the small intestine (occurs in infants or clinical patients taking antibiotics that depopulate the gut flora); and
- Contamination of a wound by the bacterium, which then secretes toxin into the bloodstream.

After exposure by any of the above routes, BoNT gains access to the bloodstream and binds to neuron-specific receptors present on presynaptic terminals of neuromuscular junctions (NMJ). NMJs are cellular structures at which a nerve terminal synapses with a muscle fiber. Activation of the nerve terminal results in the release of chemical messengers that instruct the muscle fiber to contract. By binding to presynaptic receptors, BoNTs employ a Trojan horse-like strategy to gain access to the interior of the nerve terminal, whereupon the toxin targets one of three proteins for destruction. These proteins--SNAP-25, VAMP-2 and syntaxin--are essential to the release of neurotransmitter from the neuron [8] [9]. Functionally, this means that neurons can no longer elicit muscle contraction, resulting in muscular paralysis. Once the nerves that control the diaphragm are intoxicated, emergent respiratory failure ensues and victims asphyxiate [9].

3. Medical Approaches to Protect from Intoxication. Counteragents to BoNT can either be delivered prophylactically (prior to the onset of symptoms) or therapeutically (after the onset of symptoms). Prophylactic resistance to several hundred LD₅₀s of toxin can be induced by a series of immunizations using inactivated toxin as an immunogen. Immunized persons can no longer be treated with BoNT for therapeutic or cosmetic purposes, so this approach is not widespread. Alternatively, short-term prophylactic protection can be provided by delivery of immunoglobulins harvested from previously immunized farm animals, which can scavenge BoNT while it is still in the vascular system. In animal studies, delivery of this “antitoxin” within 12 hours of challenge with over 1,000 lethal doses of BoNT has protected against paralysis. However, since the antitoxin is rapidly cleared from the body and is not effective against BoNT that has already bound to or been internalized into neurons, it only provides prophylactic protection. Due to the limited availability of the antitoxin, adverse events resulting

from cross-species reactions and short-lived protection of antitoxin preparations, widespread antitoxin prophylaxis is impractical.

Once the toxin is sequestered within the presynaptic terminus, no therapeutic approaches are currently available to accelerate the recovery from paralysis. Identifying such therapeutic candidates is the purpose of our research program [10]. It is estimated that as few as 10-100 toxin molecules per synapse are sufficient to cause paralysis, which means that a therapeutic must be exquisitely potent and highly efficient to result in clinically effective inhibition of LC activity.

A. Clinical Presentation and Treatment of BoNT Intoxication. The first clinical evidence of botulinum intoxication generally appears within 1-2 days after exposure as an acute, symmetric, descending, flaccid paralysis with a normal sensorium. These symptoms are the result of toxin that has already been internalized into neurons and therefore cannot be reversed. Once evidence of intoxication is present, clinical options are limited to supportive care and to inactivating residual toxin that may remain within the blood [11]. Victims receiving a lethal dose (described below) require ICU support, including a ventilator for respiratory support and a feeding tube for parenteral nutrition. Despite being paralyzed, patients do not suffer cognitive deficits and remain conscious, though unable to effectively communicate. Substantial resources are required to provide the full-time support necessary to care for these patients, and as few as a dozen paralyzed victims are likely to saturate the capacity of a mid-size city hospital ICU. Depending on the serotype, paralysis can persist for months, requiring sustained intensive medical care [12-13]. Furthermore, once the toxin is cleared from poisoned nerve termini, the synapse must be regenerated and coordinated neuromuscular control re-established. In a recent instance of BoNT exposure resulting from physician error, the patient required nearly a year to become ambulatory [14]. Even 5 years after the exposure, the victim still exhibits what appear to be residual morbidities, including muscle weakness, emotional distress and frequent headaches (personal communication).

4. Crisis Management and Deployment of BoNT as a Terror Weapon. Misuse of BoNT, either deliberate or accidental, is likely to result in a large number of patients simultaneously presenting with the early symptoms of intoxication. Since the first symptoms of intoxication manifest within 12-48 hours as a progressive paralysis which can easily be confused with a diversity of other illnesses, there is a high likelihood that early victims will suffer significant paralysis prior to clinical diagnosis. Since the antitoxin is most effective within 12 hours of exposure, timing is crucial in terms of reducing the extent of paralysis in the exposed population. Furthermore, due to the high potential of adverse events following immunization with a cross-species immunoglobulin preparation, clinicians may be initially hesitant to apply antitoxin without strong epidemiological or clinical evidence of exposure. Limiting the number and severity of clinically intoxicated victims will, therefore, depend on how quickly medical personnel can work through the differential diagnoses, request and obtain antitoxin, identify the potentially exposed population and deliver the antitoxin, while simultaneously managing victims.

Consequently, effective casualty management procedures depend on the early identification and treatment of potential casualties while simultaneously providing emergency care to extant victims. The ability of caretakers to ensure that the exposed population is alerted and provided with a post-exposure prophylaxis are limited by at least two key delays: the period of time before a differential diagnosis is correctly made and the delay between diagnosis and the notification and monitoring of the exposed population. These problems become more complicated once the general population becomes aware of the emergency, and healthcare facilities are flooded by healthy persons seeking prophylaxis, despite being clinically asymptomatic.

Due to the high medical resource demands of paralyzed victims, emergency care providers and clinical ICUs will find it difficult to provide beds, ventilators, personnel and ancillary critical care needs without sacrificing other clinical services for the duration of the victim's residency. In such a scenario, those victims that become symptomatic the earliest are likely to suffer the most severe paralysis. The resource bottleneck of any disaster response will be the availability of emergency personnel, ventilators and critical care beds, which can easily become overwhelmed. Thus, even a small-scale mass casualty event could rapidly disrupt the local health-care infrastructure. For anybody trained in epidemiology and crisis management, this presents a "devil's brew" of potential failure points and emphasizes the critical need for a therapeutic that offers symptomatic relief from BoNT-mediated paralysis.

A. How Severe a Threat does BoNT Really Represent? It is a truism among the biodefense community that "BoNT is the most toxic substance known." The dose of BoNT/A that will kill 50% of an exposed population is estimated from animal studies to be as low as 0.4 ng/kg body weight by intravenous administration, 3 ng/kg by inhalation and 50 ng/kg by ingestion. This means that for a 70-kg (155 lb) human, inhaling as little as 0.0002 mg (or 0.000000007 oz) of toxin is likely to result in mortality. BoNT/B and /E have similar potencies. The BoNTs are 10^3 to 10^6 times more lethal than other chemical warfare agents (such as ricin, sulfur mustard or nerve agents), resulting in their classification by the CDC as one of six Category A select agents, and the only Category A agent that is a toxin. The Category A agents have the highest priority for research and defense based on ease of dissemination, high mortality rates, the potential for major public health impact, the ability to cause public panic and social disruption, and the requirement for special action for public health preparedness [15].

B. Mathematical Models of a BoNT Deployment. Although malicious delivery of preformed toxin is possible by injection or aerosol inhalation, dispersal in food or liquid matrix may be a more plausible route for a mass casualty event. Hypothetical models describing the distribution of BoNTs in a liquid dispersal medium have been developed from real-life incidents of biotoxin exposure [16-17]. A more detailed mathematical exercise that highlights how toxin could be used in a terrorism event was presented by Stanford University Professor Lawrence Wein in a PNAS paper and a 2005 New York Times guest editorial [18-19]. Dr. Wein described procedures by which addition of gram-quantities of toxin to unpasteurized milk prior to delivery

to a raw-milk silo could result in the exposure of 10-100 times more civilians than died in the terrorist attacks on September 11, 2001.

Some back-of-the-envelope calculations substantiate how the carefully planned delivery of a small amount of neurotoxin could rapidly overwhelm a municipality's emergency management system. For example, drinking 8 ounces of liquid tainted with 3.5 ug of BoNT/A would constitute a median human lethal dose. Addition of as little as 14 ug of toxin to a quart of liquid would be sufficient to achieve this concentration. Thus, delivery of one gram of toxin (equivalent to the weight of a paperclip, and relatively easy to generate from a toxic strain of *C. botulinum* with minimal training [6]) to a bulk liquid prior to distribution would be sufficient to contaminate approximately 69,000 quart containers. If we assume that the toxin is stable in the dispersal medium, then 50% of those that drink at least 8 oz would die within 2-3 days without medical support, and nearly all would require acute and prolonged medical care. Even if this were only a regionally distributed item, one can imagine the widespread alarm and chaos once it became apparent that a commercial product had been tainted with a slow-acting, lethal toxin.

As noted in a rebuttal to Dr. Wein's paper, these scenarios include a number of simplifying assumptions, including the belief that unconventional actors would have the expertise to generate gram quantities of toxin [20]. However, given evidence of an increase in illicit producers of black market BoNT, the acquisition of knowledge and skills necessary for bulk production clearly does not present an insurmountable barrier, particularly to a state-supported organization [5]. In fact, a study by two biodefense researchers asserts that a trained laboratory technician can produce a gram of purified toxin for as little as \$2,000.⁵⁷ Instructions on growing toxic strains and purifying toxin using household items are available from multiple places online.⁵⁸ Unlike infectious agents or chemical agents that have percutaneous activity, *C. botulinum* and purified toxin can be safely handled with relatively few precautions. A more sophisticated approach would obviate the need to culture a toxic strain by synthesizing a BoNT gene sequence from publicly available databases and expressing the recombinant gene in *E. coli* using commercially available bacterial expression vectors (a routine laboratory procedure). This would also enable the facile modification of the recombinant gene, for example to modify potency or escape biosurveillance. Although production of toxin with sufficient potency to enable a mass exposure is theoretically feasible with minimal training, we would argue that a far more significant threat is presented by those malefactors with doctoral-level experience in the life sciences who have access to an equipped and functioning research facility.

If nothing else, Dr. Wein's paper described for the first time a critical security gap (which has since been mitigated) and invoked an extensive, ongoing debate in the biodefense community over what type of information should be presented in open scientific literature [21].

⁵⁷ NISC, information held by author [See *Executive Summary for editor's introduction to the Negative-Information Security Citation.*]

⁵⁸ NISC, information held by author.

It should also be noted that some food products may be more amenable to contamination with active BoNT than milk-based dairy products, although for obvious reasons these will not be discussed here.⁵⁹

6. Conclusions. The botulinum neurotoxins act with high specificity and high potency to prevent neurotransmitter release at the neuromuscular junction, causing sustained paralysis, and at sufficiently high doses, death by asphyxiation. The same characteristics that make the BoNTs such effective therapeutic tools also put them at high risk of misuse and have resulted in their classification as CDC Category A select agents. Mathematical modeling of toxin distribution and mortality rates suggests that deployment of as little as one gram by terrorists could result in 10^4 - 10^5 casualties. It is worth acknowledging that the modernization of epidemiological surveillance networks and emergency management plans since the American anthrax attacks of 2001 is likely to mitigate morbidity and mortality. Moreover, distributing sufficient toxin via contamination of commercial products, although feasible, would be a difficult undertaking and likely to be prone to failure.

A criticism of the argument that BoNT presents a significant bioterror threat revolves around the opinion that growing potent strains of *C. botulinum* and purifying sufficient toxin for a large-scale attack are more difficult than expected. These counterarguments are weakened by the transformative potential of modern molecular biology, the widespread availability of protocols, and the fact that a successful dissemination to even a small area would be highly disruptive to the economy and the medical infrastructure. In fact, contaminating a handful of products at several grocery stores by direct injection of toxin may have a disruptive effect while requiring small amounts of BoNT (less than the exempt limit) and would be relatively easy to execute without suspicion.

There is no public evidence of a successful bioterror attack against US citizens by a foreign agency following 9/11. This begs the question: if, as asserted, it is relatively easy to generate a Category A select agent such as BoNT at sufficient levels to enable its use as a terror weapon, why have such attacks not happened? In the absence of additional information we can only hypothesize. Perhaps it is merely a matter of time until such an attack occurs; perhaps we have an active, covert program that has successfully prevented such attacks from happening; perhaps those that provide direction to malefactors believe that a biological or chemical attack will mandate too severe of a response; or perhaps other, less technically intensive approaches are more suited to the current technological level of terrorist activities. Regardless, although exercises such as those presented by Dr. Wein incite controversy, they also illustrate that a successful exploitation of gaps in food security measures could have a crippling effect on our healthcare system, and would be likely to result in a transformative event that could exceed 9/11 in scope.

⁵⁹ NISC, information held by author.

The views expressed in this article are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or the U.S. Government.

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3 The 2010 Nuclear Posture Review: the Nexus of Biological Weapons Threats and U.S. Nuclear Weapons Policy

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1. Introduction. The U.S. government released its Nuclear Posture Review (NPR) Report in 2010.⁶¹ The NPR Report is declaratory policy that warns adversaries and assures allies about how the U.S. would use nuclear weapons to defend the people, territories, and vital interests of the United States. The NPR Report reflects the current administration's beliefs that nuclear weapons are not highly relevant to defending against biological weapons (BW) threats, but that unpredictable scientific developments could necessitate a return to greater reliance on nuclear weapons for protection.

2. Assessing Biological Weapons Threats. Current BW threat assessment is complicated by the fact that states and non-state actors can develop biological weapons without leaving a distinct and detectable signature. Consequently, experts such as Gregory Koblentz have observed that "little is known... about the level of effort currently devoted to using biotechnology for malevolent purposes by state and nonstate actors."⁶² Up until the 1990s the threat of biological weapons was associated almost exclusively with state sponsored biological warfare programs. Over the last two decades, however, biological terrorism by non-state actors also has emerged as a credible threat.

A. Non-state Actors and Bioterrorism. The phrase, "The Biological Century," has gained currency as the belief that the biological sciences will continue to experience spectacular and unprecedented advancements in the 21st century.⁶³ This is mostly good news, but the awareness of advances in biology also has fostered great concern about a purported explosion of biological know-how among the population at large and—by implication—among terrorists. In 2010, the Wall Street Journal noted that, "today, do-it-yourself biology clubs have sprung up where part-timers share tips on how to build high-speed centrifuges, isolate genetic material, and the

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⁶¹ U.S. Department of Defense. "Nuclear Posture Review Report, April 2010."

<http://www.defense.gov/npr/docs/2010%20nuclear%20posture%20review%20report.pdf>. The 2001 Bush administration NPR did not produce an unclassified report and is known primarily through leaked sections, while the 1994 Clinton administration NPR did not produce a final report.

⁶² Koblentz, Gregory. *Living Weapons: Biological Warfare and International Security*. Ithaca, NY: Cornell University Press, 2009, 32.

⁶³ Relman, David A. "The Biological Century: Coming to Terms with Risk in the Life Sciences." *Nature Immunology* 11, no. 4 (2010).

like.”^{64,65} It has been asserted that the scientific revolution in the life sciences amounts to a dangerous “proliferation of know-how—if not the actual pathogens.”⁶⁶

Richard Danzig warned in 2005 that “only a thin veil of terrorist ignorance and inexperience now protects us” against biological attacks.⁶⁷ He cautions, however, that in the near term, “most terrorist groups will not incline towards biological weapons,” as the technical demands of employing BW and the heightened risk of detection by law enforcement will outweigh any potential benefits of bioterrorism compared to kidnapping and suicide bombing.⁶⁸ Although Danzig concedes that “no sound calculation can be made as to whether an individual or group will effectively produce and employ biological weapons within the next decade, year or month,”⁶⁹ he is adamant that this unpredictability should not provide solace. Terrorist organizations have demonstrated their ability to work within an extended time horizon to obtain political objectives and master new techniques. Early successes with innovative terrorism tactics, even if limited, typically spawn imitators and enhancements.⁷⁰

U.S. officials also have expressed a high level of concern about non-state bioterrorism. For instance, Undersecretary of State, Ellen Tauscher, remarked in 2009 that, “while the United States remains concerned about state-sponsored biological warfare and proliferation, we are equally, if not more concerned, about an act of bioterrorism...”⁷¹

Milton Leitenberg has argued the opposing view, namely that the risk of large-scale bioterrorism is vastly overblown.^{72,73} Known terrorists groups, he claims, have “little or no scientific competence, little or no knowledge of microbiology, and no known access to pathogen strains or laboratory facilities.”⁷⁴ He noted that various high-level national threat assessments have downplayed terrorist BW capabilities^{75,76} and he further asserted that there is “no evidence”

⁶⁴Johnson, Keith. "Gains in Bioscience Cause Terror Fears." Dow Jones, <http://online.wsj.com/article/SB10001424052748703722804575369394068436132.html>

⁶⁵ For a discussion of do-it-yourself science and the governance challenge see Brian J. Gorman, Patent Office as Biosecurity gatekeeper: Fostering Responsible Science and Building Public Trust in DIY Science, 10 J. Marshall L Rev. Prop L. 423 (2011). [http://www.jmripl.com/articles/GORMAN\[1\].pdf](http://www.jmripl.com/articles/GORMAN[1].pdf).

⁶⁶ Keith. Gains in Bioscience.

⁶⁷ Danzig, Richard J. "Proliferation of Biological Weapons into Terrorist Hands." In *The Challenge of Proliferation: A Report from the Aspen Strategy Group*, edited by Kurt M. Campbell, 72: The Aspen Institute, 2005.

⁶⁸ Danzig, Richard J. "A Policymaker's Guide to Bioterrorism and What to Do About It." National Defense University, <http://www.ndu.edu/ctnsp/docUploaded//A%20Policymaker's%20Guide.pdf>, 12.

⁶⁹ Ibid., 13.

⁷⁰ Ibid.

⁷¹ Horner, Daniel. "U.S. Lays out Plans to Address Biothreats." Arms Control Association, http://www.armscontrol.org/act/2010_01-02/Biothreats.

⁷² Leitenberg, Milton. "The Self-Fulfilling Prophecy of Bioterrorism." *The Nonproliferation Review* 16, no. 1 (2009): 95 – 109.

⁷³ Leitenberg, Milton. "Bioterrorism, Hyped." *Los Angeles Times*, February 17, 2006.

⁷⁴ Leitenberg, Self-Fulfilling Prophecy, 96.

⁷⁵ Ibid.

⁷⁶ Intelligence estimates and threat assessments beyond those cited by Leitenberg also are silent on that particular topic. Blair, Dennis C. "Annual Threat Assessment of the U.S. Intelligence Community for the Senate Select

of states providing biological agents, technology or know-how to terrorist organizations.⁷⁷ Leitenberg buttressed his arguments by arguing that the 2001 “Amerithrax” attacks, which the FBI attributes solely to U.S. government scientist Bruce Ivins,⁷⁸ demonstrated that it takes a professional microbiologist working in a state-of-the-art laboratory to succeed at bioterrorism.⁷⁹ Koblenz falls somewhere between Danzig and Leitenberg. Observing that only Ivins and the Rajneeshees ever caused bioterrorism casualties (and on a very small scale at that), he asserts that “analyses of the security implications of dual-use research frequently suffer from...flaws that serve to exaggerate the severity of the threat.”⁸⁰ Thus the challenge for the U.S. national security community is to determine which of these three assessments is closest to the truth.

B. State-sponsored BW programs. In the heyday of their offensive BW programs, both the U.S. and USSR sought weapons with “nuclear scale” lethality,⁸¹ and even since the end of the Cold War, some analysts have warned that a state sponsored BW attack could cause truly massive death, injuries and illness. In the early post Cold War period, a U.S. government analysis estimated that under certain conditions, an attack with aerosolized anthrax—a primary focus of the Soviet biological warfare program—could cause up to three million deaths.⁸² More recently, John Steinbruner contemplated the deliberate creation of a pathogen that combines the virulence/lethality of smallpox with the contagiousness of the 1918 influenza.⁸³ That possibility, he concluded, means that “one can imagine killing more people with an advanced pathogen than with the current nuclear weapons arsenal.”⁸⁴ Since the U.S. abjured offensive BW in 1969, nuclear weapons have been the only weapons in the U.S. arsenal capable of delivering retaliation on a scale commensurate with a worst case BW attack.⁸⁵ Thus analysts continue to argue that America may need nuclear weapons to deter biological attacks.⁸⁶

The State Department has issued three reports over the last decade documenting the official

Committee on Intelligence." http://www.dni.gov/testimonies/20100202_testimony.pdf, and Clapper, James R. "Statement for the Record on the Worldwide Threat Assessment of the U.S. Intelligence Community for the House Permanent Select Committee on Intelligence." http://www.dni.gov/testimonies/20110210_testimony_clapper.pdf.

⁷⁷ Leitenberg, *Self-Fulfilling Prophecy*, 99.

⁷⁸ Bhattacharjee, Yudhijit. "FBI Closes Anthrax Case, Says Bruce Ivins Was Sole Culprit Behind Letter Attacks." AAAS, <http://news.sciencemag.org/scienceinsider/2010/02/-fbi-closes-anthrax-case-says-br.html>.

⁷⁹ Leitenberg, "Self-Fulfilling Prophecy," 100.

⁸⁰ Koblenz, Gregory. "Biosecurity Reconsidered: Calibrating Biological Threats and Responses." *International Security* 34, no. 4 (2010), 116.

⁸¹ Guillemin, Jeanne. *Biological Weapons: From the Invention of State-Sponsored Programs to Contemporary Bioterrorism*. New York, NY: Columbia University Press, 2005. 92-111.

⁸² U.S. Office of Technology Assessment. "Proliferation of Weapons of Mass Destruction: Assessing the Risks." Washington, DC: U.S. GPO, 1993, 54.

⁸³ Steinbruner, John D. *Principles of Global Security*. Washington, DC: Brookings Institution Press, 2000, 181.

⁸⁴ *Ibid.*, p178.

⁸⁵ See Ford, Christopher. "Conventional 'Replacement' of Nuclear Weapons?" <http://www.newparadigmsforum.com/NPFtestsite/?p=546>.

⁸⁶ This argument is made in Pifer, Steven, Richard C. Bush, and V. Felbab-Brown. *U.S. Nuclear and Extended Deterrence: Considerations and Challenges*. Washington, DC: Brookings, 2010, 46, and O'Hanlon, Michael A. *Skeptic's Case for Nuclear Disarmament*. Washington, DC: Brookings, 2010.

U.S. view of whether other states have offensive BW programs that are prohibited under the BWC.⁸⁷ Whereas the 2001 and 2005 reports firmly accused Russia, China and Iran of having prohibited programs, the 2010 report simply says that these states show evidence of engaging in prohibited activities, and that they are not as forthcoming as they need to be to remove doubt. In 2010, only North Korea and Syria received unambiguous reprimands for engaging in offensive weapons programs (down from seven nations in 2001 and five in 2005). Leitenberg also questioned whether the earlier estimates may have been too high, possibly due to having relied upon inadequate intelligence.⁸⁸

3. Purported Roles of Nuclear Weapons in Defending Against BW Threats. The National Strategy for Countering Biological Threats⁸⁹ outlines the U.S. government's multifaceted response to the threat of bioterrorism. It states that "where we identify States, groups or individuals seeking to acquire or use biological weapons, we will use all appropriate means to disrupt or deny their efforts, drawing on a wide range of counterterrorism, counterproliferation, intelligence, law enforcement and other tools."⁹⁰ Interpreting "other tools" to mean nuclear weapons would be a reach. Likewise, the NPR Report does not suggest that nuclear weapons play a role in protecting the United States against nuclear or any other kind of WMD terrorism. Historically, though, the government has taken the position that nuclear weapons can protect the U.S. against state-sponsored BW programs in two ways. First, threats of nuclear retaliation may deter BW attacks. Second, the U.S. military could use nuclear weapons to destroy enemy stockpiles of biological agents in war or in a preventive first strike.

A. Deterrence of State BW Attacks.⁹¹ President Roosevelt stated in 1943 that the U.S. would not be the first to use BW, but would retain a retaliatory capability for purposes of deterrence.⁹² This remained U.S. declaratory policy regarding BW until President Nixon ended the nation's offensive BW program in 1969. Before Nixon's action, there was substantial disagreement within the national security establishment concerning BW's utility for various military purposes, their ability to deter biological or nuclear attacks, or even nuclear weapons' ability to deter biological attacks. Such questions were hotly debated internally as Nixon

⁸⁷ U.S. Department of State. "Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments." U.S. Department of State. "Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments, August 2005." U.S. Department of State. "Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments, July 2010." <http://www.state.gov/documents/organization/22466.pdf>, <http://www.state.gov/documents/organization/52113.pdf>, and <http://www.state.gov/documents/organization/145181.pdf>.

⁸⁸ Leitenberg, *Self-Fulfilling Prophecy*, 98.

⁸⁹ National Security Council. "National Strategy for Countering Biological Threats." http://www.whitehouse.gov/sites/default/files/National_Strategy_for_Countering_BioThreats.pdf.

⁹⁰ *Ibid.*, 16.

⁹¹ For an outstanding overview of deterrence, see Freedman, Lawrence. *Deterrence*. Cambridge, UK: Polity Press, 2004.

⁹² Goldman, David I. "The Generals and the Germs: The Army Leadership's Response to Nixon's Review of Chemical and Biological Warfare Policies in 1969." *Journal of Military History* 73, no. 2 (2009), 534.

considered jettisoning biological warfare; even then National Security Advisor Kissinger found it necessary to assure the president that nuclear weapons would serve as a sufficient deterrent against biological attacks by states.⁹³ It is likely, however, that Nixon already had reached that conclusion. In a famous 1970 remark to William Safire, Nixon said: "We'll never use the damn germs, so what good is biological warfare as a deterrent? If somebody uses germs on us, we'll nuke 'em."⁹⁴ He and Kissinger no doubt assumed that any would-be adversary of the United States would discern that unspoken threat.

Deterrence theory is hardly absolute when it comes to the relationships among states with nuclear weapons and those without. According to a recent study, "the deterrence relationships involving nuclear states and non-nuclear states in possession of other WMD capabilities are fraught with uncertainties."⁹⁵ Koblentz and Susan Martin, two scholars who have devoted substantial attention to the national security and military functions of BW, say little about nuclear deterrence of BW attacks in their seminal articles on the issue.⁹⁶ Martin, however, strongly implies that BW are potent enough to deter even nuclear threats.⁹⁷

Drawing upon history rather than theory, Scott Sagan asserts that there is "little firm historical evidence on which to judge whether and how nuclear threats can deter chemical or biological attacks..." and he argues that it is dangerous for a leader to make nuclear threats for that purpose.⁹⁸ Doing so, he believes, puts the leader's and nation's reputation on the line; if deterrence fails, the leader will feel more compelled to actually retaliate with nuclear weapons than if he had not made such a threat.⁹⁹ Martin isn't bothered by that. Given the immense potential lethality of BW, she says, the extra deterrence that a perceived nuclear threat provides is "well worth" running a higher risk of retaliating with nuclear weapons if deterrence fails.¹⁰⁰

B. Destroying stockpiles of biological agents. Following the demise of the Soviet Union, concerns about WMDs from "rogue nations" quickly came to the fore. Just as quickly, U.S. nuclear planners became more flexible and revised their targeting methodology to include BW

⁹³ Ibid., 560.

⁹⁴ Safire, William. "On Language: Weapons of Mass Destruction." <http://www.nytimes.com/1998/04/19/magazine/on-language-weapons-of-mass-destruction.html?scp=1&sq=%22on%20language%20weapons%20of%20mass%22&st=cse>

⁹⁵ Paul, T. V., Patrick M. Morgan, and James J. Wirtz, eds. *Complex Deterrence: Strategy in the Global Age*. Chicago, IL: University of Chicago Press, 2009, 14.

⁹⁶ Koblentz, Pathogens as Weapons, 84-122 and Martin, S. B. "The Role of Biological Weapons in International Politics: The Real Military Revolution." *Journal of Strategic Studies* 25, no. 1 (2002), 63-98.

⁹⁷ Martin, The Role of Biological Weapons, 64. BW "can serve as a strategic deterrent to protect the vital interests and core values of states."

⁹⁸ Sagan, Scott D. "The Commitment Trap: Why the United States Should Not Use Nuclear Threats to Deter Biological and Chemical Weapons Attacks." *International Security* 24, no. 4 (2000): 97.

⁹⁹ Ibid., 85-115.

¹⁰⁰ Martin, Susan B., and Scott D. Sagan. "Correspondence: Responding to Chemical and Biological Threats." *International Security* 25, no. 4 (2001): 195.

targets.¹⁰¹ The Pentagon began research on precision-guided nuclear weapons that would hit targets with amazing accuracy, have lower yields and kill fewer civilians, and be able to destroy buried or even mobile targets. DoD was particularly interested in weapons that could destroy buried caches of biological agents and deeply-buried command and control bunkers where megalomaniacal leaders who had attacked the U.S. with WMD might otherwise hide out and survive.¹⁰²

In 1997 Keith Payne, soon to become one of the architects of the Bush Administration's 2001 Nuclear Posture Review,¹⁰³ argued that absent impeccable intelligence about an adversary possessing BW, it is virtually impossible to have confidence that threats to retaliate with either conventional or nuclear weapons will dissuade that adversary from attacking. In a hint of administration posture to follow, Payne urged that "U.S. policy should hedge against the possibility of its own failure," and be prepared both to issue and to execute threats to destroy an opponent's BW, rather than limit itself to retaliation.¹⁰⁴

The Pentagon, however, believed that conventional weapons had severe limitations for destroying stockpiles of biological agents. They released "insufficient energy to heat to lethal temperatures the large masses of agent stored in moderate-sized or large facilities, [and as a result] significant quantities of live agent could survive and be dispersed over very large areas, potentially causing the deaths of tens or hundreds of thousands of civilians..."¹⁰⁵

The George W. Bush Administration raised the priority for so-called "bunker buster" nuclear weapons that could fully neutralize biological agents and avoid the risk of infecting nearby civilians, and thus provide a hedge against deterrence failure. It sought long-term funding for a weapon called the Robust Nuclear Earth Penetrator (RNEP).¹⁰⁶ A number of analyses, however, questioned whether either existing nuclear stockpile weapons or the RNEP could sterilize deeply buried biological agents.¹⁰⁷ They also questioned if it was possible to estimate or ethically balance the tradeoffs (i.e., the increased deaths from nuclear collateral

¹⁰¹ For an overview of how U.S. nuclear weapons planning evolved after the fall of the Soviet Union, see Kristensen, Hans. "Targets of Opportunity." *Bulletin of the Atomic Scientists* 53, no. 5 (1997): 22-28.

¹⁰² For a brief discussion of the leader willing to sacrifice his entire country as long as he survives, see Speed, Roger, and Michael May. "Assessing the United States' Nuclear Posture." In *U.S. Nuclear Weapons Policy: Confronting Today's Threats*, edited by George Bunn and Christopher F. Chyba. Washington, DC: Brookings Institution Press, 2006, 267.

¹⁰³ Halperin, Morton H., Bruno Tertrais, Keith B. Payne, K. Subrahmanyam, and Scott D. Sagan. "Forum: The Case for No First Use: An Exchange." *Survival: Global Politics and Strategy* 51, no. 5 (2009): 38.

¹⁰⁴ Payne, Keith B. "Deterring the Use of Weapons of Mass Destruction: Lessons from History." In *The Niche Threat: Deterring the Use of Chemical and Biological Weapons*, edited by Stuart E. Johnson, 71-94: National Defense University Press, 1997, 85.

¹⁰⁵ Speed and May, *Assessing the United States' Nuclear Posture*, 260.

¹⁰⁶ Union of Concerned Scientists. "The Robust Nuclear Earth Penetrator (RNEP)." http://www.ucsusa.org/nuclear_weapons_and_global_security/nuclear_weapons/technical_issues/the-robust-nuclear-earth.html.

¹⁰⁷ May, Michael, and Zachary Haldeman. "The Effectiveness of Nuclear Weapons against Buried Biological Agents." *Science & Global Security* 12, no. 1-2 (2004): 91-114.

damage versus the lives spared by reduced dispersal of biological agents) that would arise from destroying biological agents with nuclear instead of conventional weapons.¹⁰⁸ After Congress ended funding for RNEP in 2005,¹⁰⁹ DoD accelerated development of several conventional bombs that can penetrate deeply underground before detonating massive non-nuclear payloads.¹¹⁰ These new conventional capacities will bring into question any future U.S. threats to use nuclear weapons to destroy buried BW or agents.¹¹¹

4. The 2010 NPR and Declaratory Nuclear Policy. The 2010 Nuclear Posture Review Report constitutes the United States' current "declaratory nuclear policy." A 1995 RAND monograph states that "the principal function of declaratory policy is to suggest the circumstances under which the United States will consider specific retaliatory options...It signals U.S. perceptions of the gravity of specific acts by announcing those retaliatory options the United States might exercise..."¹¹² A decades-long debate over how specific, transparent, or ambiguous declaratory nuclear policy should be in order to best protect American security carried over into the 2010 NPR process and the NPR Report. This discussion elicited strongly conflicting positions around the issues of "Negative Security Assurances," "No First Use" pledges and the role of nuclear weapons in general.

A. Negative Security Assurances. A "Negative security assurance" (NSA) is a statement describing those circumstances under which a nation engaged in a military conflict with the United States can assume that the United States will not attack it (or retaliate against it) with nuclear weapons. Prior to the 2010 NPR, U.S. presidents had issued NSA's three times. The original 1978 Carter version said: "The United States will not use nuclear weapons against any non-nuclear-weapon State Party to the NPT or any comparable internationally binding commitment not to acquire nuclear explosive devices, except in the case of an attack on the United States, its territories or armed forces, or its allies, by such a State allied to a nuclear-weapon State or associated with a nuclear-weapon State in carrying out or sustaining the

¹⁰⁸ Speed and May, *Assessing the United States' Nuclear Posture*, 260-263.

¹⁰⁹ Defense Industry Daily. "Congress Cancels R&D for Nuclear Earth Penetrator."

<http://www.defenseindustrydaily.com/congress-cancels-rd-for-nuclear-earthpenetrator-bombs-01404/>

¹¹⁰ For descriptions of non-nuclear penetrating weapons: Walker, Steven H. "Fiscal Year 2012 Air Force Science and Technology: Presentation to House Armed Services Committee Subcommittee on Emerging Threats and Capabilities," 16, <http://www.airforce-magazine.com/SiteCollectionDocuments/Testimony/2011/March%202011/030111walker.pdf>; Ackerman, Spencer. "Europe's Hardbut Missile Is Your Ultimate Penetrator." *wired.com*, <http://www.wired.com/dangerroom/2010/10/europes-hardbut-missile-is-your-ultimate-penetrator/>; U.S. Air Force Research Laboratory. "Hard and Deeply Buried Target (Hdbt) Technology." <http://www.eglin.af.mil/library/factsheets/factsheet.asp?id=16670>. Bennett, Chuck. "We Can Bust Your Bunkers-- New Earth-Shattering Weapon." *New York Post*, October 14, 2009; and Defense Industry Daily. "Mopping Up: The USA's 30,000 Pound Bomb ." <http://www.defenseindustrydaily.com/mopping-up-the-usas-30000-pound-bomb-03172/>

¹¹¹ Tegnelia, James. "Nuclear Reactions-the 2010 Nuclear Posture Review, Comments on the Nuclear Week." Center for Strategic & International Studies, <http://csis.org/blog/nuclear-reactions-2010-nuclear-posture-review>.

¹¹² Gompert, David, Kenneth Watman, and Dean Wilkening. "U.S. Nuclear Declaratory Policy: The Question of Nuclear First Use." RAND, http://www.rand.org/pubs/monograph_reports/2007/MR596.pdf. 7.

attack.”¹¹³ President Clinton’s 1995 reaffirmation of the NSA put states to which the U.S. had extended a security commitment on a par with allies and clarified that a non-nuclear weapon state must be in compliance with the NPT in order to count on the NSA, but otherwise left the wording alone.¹¹⁴ The Bush Administration extended Clinton’s NSA essentially verbatim.¹¹⁵

The 2010 NSA states simply that “the United States will not use or threaten to use nuclear weapons against non-nuclear weapons states that are party to the NPT and in compliance with their nuclear non-proliferation obligations.”¹¹⁶ However, the NPR Report also contains what former Secretary of State James Baker has called “wobble room”—language that gives the administration an “out” if the dreaded Frankenstein pathogen or mega-anthrax attack becomes more plausible.¹¹⁷ The Report asserts that “given the catastrophic potential of biological weapons and the rapid pace of bio-technology development, the United States reserves the right to make any adjustment in the assurance that may be warranted by the evolution and proliferation of the biological weapons threat and U.S. capacities to counter that threat.”¹¹⁸

B. A Declining Reliance upon Nuclear Weapons to Protect Against BW Threats. The NPR Report also affirms that since the end of the Cold War, “the role of U.S. nuclear weapons in deterring non-nuclear attacks – conventional, biological, or chemical – has declined significantly,” and it sets two long-term goals. First, “the United States will continue to reduce the role of nuclear weapons in deterring non-nuclear attacks.”¹¹⁹ Second, “the United States will consult with allies and partners regarding the conditions under which it would be prudent to shift to a policy under which deterring nuclear attack is the *sole* purpose of U.S. nuclear weapons (emphasis added).”¹²⁰ In other words, in spite of the seemingly straightforward NSA, the U.S. is not yet willing to totally decouple nuclear and biological weapons.

C. No “No First Use” Pledge. The 2010 NPR is silent on another relevant aspect of nuclear declaratory policy known as “no first use” (NFU). A state adopting a NFU position asserts that it will not be the first to use nuclear weapons against another, and would launch nuclear armed missiles or bombers only after having absorbed a nuclear first strike. Such a policy--if observed--would preclude a country from using nuclear weapons either preventively, to destroy another state’s BW stockpiles or emerging BW capability, or to retaliate against an

¹¹³ <http://www.ppnn.soton.ac.uk/bb2/Bb2secK.pdf>, referenced in Collina, Tom Z. “U.S. ‘Negative Security Assurances’ at a Glance.” Arms Control Association, <http://www.armscontrol.org/print/117>. The exception language, known as the “Warsaw Pact clause,” put the USSR on notice that launching attacks on the U.S. through its satellites would not protect either the USSR or its satellites from nuclear retaliation.

¹¹⁴ *Ibid.*

¹¹⁵ U.S. Department of State. “Richard Boucher, Spokesman, Daily Press Briefing, February 22, 2002.” <http://2001-2009.state.gov/r/pa/prs/dpb/2002/8421.htm>.

¹¹⁶ DoD, Nuclear Posture Review Report, viii.

¹¹⁷ U.S. Senate Committee on Foreign Relations. “Complete New Start Hearings for the 111th Congress (General).” <http://foreign.senate.gov/treaties/details/?id=1668ace8-5056-a032-526a-29c8fc32e1dc>, 147.

¹¹⁸ DoD, Nuclear Posture Review Report, viii.

¹¹⁹ *Ibid.*, viii.

¹²⁰ *Ibid.*, 48.

actual BW attack. An explicit NFU pledge would be inconsistent with any attempt to use nuclear threats to deter biological weapon attacks through either dissuasion or denial. The administration would not go that far.¹²¹

D. Calculated Ambiguity. Biological threats, weapons, warfare or attacks are barely mentioned within the 442 pages of publicly available Senate Foreign Relations Committee testimony on the New START Treaty.¹²² However, several former senior defense and diplomatic officials and senators express nostalgia for the “calculated ambiguity” which they believe has been compromised by the new, seemingly less conditional NSA.¹²³ “Calculated ambiguity” means being deliberately coy with adversaries as to whether or not you will retaliate against a WMD attack with nuclear weapons. Proponents of calculated ambiguity rely primarily upon a particular reading of Saddam Hussein’s behavior in 1991; they believe that ambiguous but unmistakable threats of nuclear retaliation communicated by President Bush and Secretary Baker, dissuaded Saddam from attacking U.S. forces or Israel with chemical or BW.¹²⁴ Sagan has argued against this interpretation for over a decade.^{125,126}

E. Declaratory Policy vs. Actual Policy. Contradictions between a state’s declaratory policy and its leaders’ actual behavior are nothing new. In fact, one analyst who carefully compared U.S. declaratory nuclear policy with actual nuclear developments over the last two decades concluded that there has been “a fundamental disharmony between declared policy and U.S. nuclear warriors’ activities...”¹²⁷ In 1995 President Clinton reaffirmed Carter’s 1978 NSA, even though Clinton’s own 1994 nuclear posture review had proposed using nuclear weapons to deter biological weapon attacks. Throughout the 1990s, the Pentagon invested heavily in nuclear technology for that purpose and added BW to nuclear target lists.¹²⁸ U.S. officials repeatedly offered ambiguous statements suggesting the possibility of nuclear retaliation for biological attacks, notwithstanding the NSAs then in effect.¹²⁹ In fact, the Bush State Department official who affirmed the Clinton NSA in 2002 effectively negated it in the next breath. Immediately after reiterating that the United States “will not use nuclear weapons against non-nuclear weapon states parties to the [NPT],” he added, “If a weapon of mass destruction is used against the

¹²¹ For a discussion of this topic, see Sagan, Scott D. “The Case for No First Use.” *Survival: Global Politics and Strategy* 51, no. 3 (2009): 163 – 82, and Halperin, “Forum: The Case for No First Use.”

¹²² Committee on Foreign Relations, New Start Hearings.

¹²³ *Ibid.*, 184.

¹²⁴ Committee on Foreign Relations. “Complete New Start Hearings.”

¹²⁵ Sagan, “The Commitment Trap.”

¹²⁶ Halperin, “Forum: The Case for No First Use.”

¹²⁷ Kristensen, *Targets of Opportunity*, 22.

¹²⁸ See Kristensen, *Targets of Opportunity*, 22-28 ; “Nuclear Futures: Proliferation of Weapons of Mass Destruction and Us Nuclear Strategy.” British American Security Information Council, <http://www.nukestrat.com/pubs/nfuture2.pdf>; and “U.S. Nuclear Strategy Reform in the 1990s.” Nautilus Institute, <http://oldsite.nautilus.org/archives/nukestrat/StratRef.PDF>.

¹²⁹ Collina, Tom Z. “U.S. ‘Negative Security Assurances’ at a Glance.” Arms Control Association, <http://www.armscontrol.org/print/117>.

United States or its allies, we will not rule out any specific type of military response.”¹³⁰ One must assume that U.S. leaders’ willingness to contradict national declaratory policy influences the calculations of potential adversaries.¹³¹

5. Conclusion. The 2010 NPR briefly focused attention on the historically limited relationships between BW and nuclear weapons, and shows that those relationships remain of marginal importance within nuclear weapons policy. The NPR Report reflects a retreat from the Bush Administration’s view that an effective way to discourage malevolent actors from developing BW is to have nuclear weapons capable of destroying such weapons with minimum collateral damage, no matter where such BW may be hidden or buried. The new, streamlined NSA appears to undermine “calculated ambiguity,” but that may merely be a side effect of its main purpose, which is to encourage states to comply with the NPT. Finally, the NPR Report articulates the aspiration to totally decouple nuclear weapons and biological threats as one step on the road to a nuclear-free world. However, the NSA’s “wobble room” shows that nuclear declaratory policy remains constrained by beliefs that scientific advances may yet enable enemies to create utterly devastating BW, and that only the threat of nuclear retaliation will deter parties from pursuing that path. Nothing on the horizon suggests that this fear will diminish. Overall, the 2010 NPR produced modest changes in long-standing declaratory policy regarding BW. In the words of State Department official Robert J. Einhorn, one of the officials dispatched to spin the NPR Report upon its release, “this is an evolutionary approach rather than a revolutionary approach.”¹³²

¹³⁰ U.S. Department of State. “Richard Boucher, Spokesman, Daily Press Briefing, February 22, 2002.” <http://2001-2009.state.gov/r/pa/prs/dpb/2002/8421.htm>.

¹³¹ Stephen Walt writes “No matter what the U.S. government *says* about its nuclear strategy, no potential adversary can confidently assume that the U.S. would stick to its declared policy in the event of a crisis or war...(emphasis original) To the extent that nuclear weapons deter...it is the mere fact of their existence and not the specific words we use when we speak about them...Because the prospect of nuclear use is so awful, no minimally rational aggressor is going to run that risk solely because of some words typed in a posture statement.” “Nuclear Posture Review (or Nuclear Public Relations?)” In *A Realist in an Ideological Age*: Foreignpolicy.com, 2010, http://walt.foreignpolicy.com/posts/2010/04/06/nuclear_posture_review_or_nuclear_public_relations.

¹³² Council on Foreign Relations. “Transcript: Nuclear Posture Review.” (2010), <http://www.cfr.org/proliferation/nuclear-posture-review/p21861>.

4 The Proliferation Security Initiative: from *So San* Dilemma to *M/V Light* Success

Brian J. Gorman and Matthew Burch

1. Origins of the Proliferation Security Initiative. The Proliferation Security Initiative (PSI) is a global cooperative interdiction effort designed to deter and physically interrupt the proliferation of weapons of mass destruction (WMDs) by non-state actors.¹³³ Members of the PSI mutually agree to subject their state flagged ships –operated by non-state actors-- to interdiction efforts designed to thwart the proliferation of WMD.¹³⁴ PSI member states voluntarily share intelligence and conduct joint exercises in furtherance of the agreement. PSI members also work together to target ships subject to interdiction according to extant international law, i.e. ships without a state flag or a ship flying the flags of two nations. The initiative is not universally accepted and it has critics,¹³⁵ but it recently enjoyed a rare victory¹³⁶ and it has gained steady acceptance since its introduction by President Bush in May 2003. The PSI has grown from 50 members in 2003 to 98 in 2010. (*See Diagram 1*)

The PSI does not create a new legal framework for states to conduct interdictions.¹³⁷ Rather, the PSI is a “voluntary organization in which countries agree to take steps to halt proliferation” of nuclear, biological, and chemical weapons between and among themselves, i.e., member states.¹³⁸ The PSI, however, is compatible with international laws such as United Nations Security Council Resolution (UNSCR) 1540. The U.S. encourages states to join by noting that participation counts toward obligatory compliance with UNSCR 1540 and other resolutions.¹³⁹

¹³³ See the Department of State [<http://www.state.gov/t/isn/c10390.htm>]The PSI is a “global effort that aims to stop trafficking of weapons of mass destruction (WMD), their delivery systems, and related materials to and from states and non-state actors of proliferation concern worldwide.”

¹³⁴ Mary Nikitin, “*Proliferation Security Initiative (PSI)*”, 18 January 2011, Congressional Research Service “A key gap in the PSI framework is that it applies only to commercial, not government, transportation. Government vehicles (ships, planes, trucks, etc.) cannot legally be interdicted.” at 4.

¹³⁵ William Baumgartner, “*UNCLOS Needed for America’s Security*,” TEXAS REV OF LAW & POLITICS, Spring 2008, Vol. 2 Iss. 2, pp. 445-451, at 451. Some consider the PSI “a renegade regime that flies in the face of international law.”

¹³⁶ David E. Sanger, “*U.S. Said to Turn Back North Korea Missile Shipment*,” NEW YORK TIMES, June 12, 2011. http://www.nytimes.com/2011/06/13/world/asia/13missile.html?_r=1 last checked June 15, 2011.

¹³⁷ Yann-Huei Song, “*The U.S.-Led Proliferation Security Initiative and UNCLOS: Legality, Implementation, and an Assessment*”, OCEAN DEVELOPMENT & INTERNATIONAL LAW, 38: 101-145 (2007) at 106.

¹³⁸ Justin Muzinich, “*The Nuke in the Cargo Hold*”, POLICY REV, Aug. & Sept. 2010, Iss. 162, pp. 83-92.

¹³⁹ See *supra* note 134 at 6. “The State Department has said that participating in PSI is a way for states to comply with their obligations under UN Security Council resolutions 1718, 1737, 1803, and 1540.”

A. The *So San* Incident. The *So San* incident is widely associated with the development of the PSI.¹⁴⁰ The illegal transportation of WMD related materials had been a well known problem before the *So San* incident.¹⁴¹ But the *So San* incident inspired the search for a remedy to a situation which revealed legal gaps and a lack of authority under international law to detain vessels carrying illicit weapons.

The U.S. suspected that the *So San*, which departed from North Korea, might be transporting arms to terrorists and asked Spanish authorities in the vicinity to interdict the ship.¹⁴² The *So San* refused to stop and the Spanish Navy boarded the ship via helicopter on December 9, 2002. Once on board the Spanish found 15 complete SCUD missiles, 15 conventional warheads, 23 containers of nitric acid fuel, and 85 barrels of unidentified chemicals that were not listed on the manifest and hidden under other cargo.¹⁴³ The interdiction was regarded as legal because the *So San* was in international waters and not flying a state flag.¹⁴⁴ Moreover, there was no ship under that name in the North Korean registry.¹⁴⁵

The U.S. and Spanish forces, however, had no legal basis to seize the cargo once it was learned that the cargo was purchased by Yemen.¹⁴⁶ Additionally, assurances were made that the materials would not be retransferred to other entities.¹⁴⁷ The creation of the PSI did not provide an “answer” to a *So San* type of situation, but it is clear that incident helped draw attention to the need for improved interdiction efforts and international cooperation.

2. Authority and Limitations of the PSI. Commentators overwhelmingly acknowledge that the PSI is limited by extant international laws.

Much of PSI involves nothing more than the consistent and rigorous application of existing rights under national and international law. Concurrently, the initiative

¹⁴⁰ Editors, “*The Proliferation Security Initiative: A Model for Future International Collaboration*”, COMPARATIVE STRATEGY, Nov. & Dec. 2009, Vol. 28 Iss. 5, pp. 395-562. At 410. “The White House then decided that the issue was sufficiently important and innovative in its approach to WMD and missile proliferation that it warranted a Presidential initiative.” Nikitin, Mary, “*Proliferation Security Initiative (PSI)*”, 18 January 2011, Congressional Research Service, at 1, “PSI was started partially in response to legal gaps revealed in an incomplete interdiction of the *So San*, a North Korean-flagged ship that was carrying Scud missiles parts to Yemen in December 2002.”

¹⁴¹ See *supra* note 138 at pp. 83-92. “Since beginning to monitor incidents of nuclear trafficking in 1995, the International Atomic Energy Agency (IAEA) has documented at least 196 instances of illegal trafficking, including at least 18 that involved weapons grade, highly enriched uranium and plutonium, the primary fuel of nuclear weapons.”

¹⁴² Editors, “*The Proliferation Security Initiative: A Model for Future International Collaboration*”, COMPARATIVE STRATEGY, Nov. & Dec. 2009, Vol. 28 Iss. 5, p395-562, at 410.

¹⁴³ *Id.*

¹⁴⁴ *Id.*

¹⁴⁵ See *supra* note 134 at 1.

¹⁴⁶ Mary Nikitin, “*Proliferation Security Initiative (PSI)*”, 18 January 2011, Congressional Research Service. P. 1. Editors, “*The Proliferation Security Initiative: A Model for Future International Collaboration*”, COMPARATIVE STRATEGY, Nov. & Dec 2009, Vol. 28 Iss. 5, p395-562. at 410.

¹⁴⁷ *Id.*

promotes the development of new legal authorities by way of bilateral and multilateral treaties.¹⁴⁸

Hodgkinson et al. agreed, stating, "PSI does not specifically establish any boarding authority and does not provide participating states with any new legal authority to conduct interdictions in international waters."¹⁴⁹ UNSCR 1540 does not authorize PSI interdictions of ships flying flags of non-member states. Yann-Huei Song provided the factors to consider before an interception.

Three major factors should be considered in determining if a PSI interception is permissible under international law: first, the nature of cargo transferred or transported by the intercepted vessel; second, the location where the interception action takes place; and third, the nationality of the intercepted vessel. These three factors are all related to the rights enjoyed and obligations borne by the intercepted and intercepting countries under international customary and treaty law; in particular, the law of the sea as set out in the UNCLOS.¹⁵⁰

A. Turbidity in the Literature. It appears that the compatibility between UNSCR 1540 and the PSI in addition to U.S. assurances that participation in the PSI counts toward compliance with UNSCR 1540¹⁵¹ may actually invite some confusion in the literature. Song noted that,

The United States maintains that the PSI Statement of Interdiction Principles are consistent with the UN Security Resolution 1540, operative paragraph 10 which 'calls upon all States, in accordance with their national legal authorities and legislation and consistent with international law, to take cooperative action to prevent illicit trafficking in nuclear, chemical or biological weapons, their means of delivery, and related materials.'¹⁵²

UNSCR 1540, however, did not provide any enforcement authority, nor did it specifically mention interdiction or PSI.¹⁵³ In fact, according to a Congressional Research Service report, "early drafts of the resolution put forward by the United States had included explicit language calling on states to interdict if necessary shipments related to WMD. However, over China's

¹⁴⁸ Michael Byers, "Policing the High Seas: The Proliferation Security Initiative," THE AMERICAN JOURNAL OF INTERNATIONAL LAW, Vol. 98, No. 3 (July, 2004), pp. 526-545. Pg. 528. Logan, Samuel E., "The Proliferation Security Initiative: Navigating the Legal Challenges," JOURNAL OF TRANSNATIONAL LAW & POLICY, Vol. 14:2 Spring, 2005, pp 253-272. "According to the Statement [of Interdiction Principles], PSI countries are to pursue the goals of the initiative "to the extent their national legal authorities permit and consistent with their obligations under international law and frameworks." at. 257.

¹⁴⁹ Sandra L. Hodgkinson, "Challenges to Maritime Interception Operations in the War on Terror: Bridging the Gap," 22 AM. U. INT'L L. REV. 583, 2007.

¹⁵⁰ See *supra* note 137 at 113.

¹⁵¹ See *supra* note 134 at 6. "The State Department has said that participating in PSI is a way for states to comply with their obligations under UN Security Council Resolutions 1718, 1737, 1747, 1803, and 1540."

¹⁵² See *supra* note 137 at 113

¹⁵³ See *supra* note 134 at 6.

objections, the word ‘interdict’ was removed and was changed to ‘take cooperative action to prevent illicit trafficking’ in WMD.”¹⁵⁴

Thus, nuances between the two initiatives are critical and caution needs to be exercised when comparing or linking UNSCR 1540 and the PSI. For instance, Auerswald made the following broad statement which appears to be at variance with prevailing authorities cited above. He said, “[T]he [1540] resolution provides international legal authorization for PSI-related interdiction of WMD trafficking.”¹⁵⁵ That statement needs a significant amount of clarification to be consistent with prevailing authorities discussed above. Auerswald then followed that statement with a citation to FAQs on PSI at the Department of State website. He stated, “According to the State Department, ‘If an activity is authorized under a UNSC resolution, then it could be cited by a PSI participant as authority for its participation in an interdiction. ... UNSC 1540 and the PSI SOP are mutually reinforcing and are legally and politically compatible.’” The State Department comments are accurate, but it is doubtful that they could provide sufficient justification to assert in the main that, “UNSCR 1540 provides international legal authorization for PSI-related interdiction of WMD trafficking,” --unless it is made clear that these interdictions are limited to ships from participating PSI states.

Kaliadin likewise argues that UNSCR 1540 “helps establish the necessary legal foundations for PSI-related activities. [since] ...its key statements and its messages are in line with PSI's principles.”¹⁵⁶ In contrast, however, Cotton’s observation appears to hold true when he simply stated, “It is not yet possible to reconcile the ambitious intentions of the PSI with current international law and practice.”¹⁵⁷ He stated that “further cooperation with key states will be necessary, and a specific UN Security Council endorsement will be required.”¹⁵⁸ Logan likewise points out that, UNSCR 1540 is insufficient justification in itself for PSI. He argues that, “The Resolution recognizes proliferation to be ‘a threat to international peace and security,’ but does not explicitly authorize the types of interdictions to take place under the PSI.”¹⁵⁹

Baumgartner argued, however, that the adoption of certain international laws can help bolster the legitimacy of the PSI. Baumgartner argued that if the U.S. accedes to UNCLOS it, “...will help our PSI efforts. It will remove the invalid, incorrect, bogus argument that PSI is a renegade regime that flies in the face of international law.”¹⁶⁰ Baumgartner’s position is consistent with that of U.S. military leaders. Song noted that, “officials from the U.S. Navy, the

¹⁵⁴ *Id.*

¹⁵⁵ David P. Auerswald, “*Deterring Nonstate WMD Attacks*,” POL SCI QLY, at 562.

¹⁵⁶ Aleksandr Kaliadin, “*In Search of an Effective Coercive Strategy to Deter Weapons of Mass Destruction*,” RUSSIAN SOCIAL SCIENCE REVIEW, Vol. 49, no. 2, Mar-April 2008, pp. 77-93.

¹⁵⁷ James Cotton, “*The Proliferation Security Initiative and North Korea: Legality and Limitations of a Coalition Strategy*,” SECURITY DIALOGUE, Vol. 36 Iss. 2, pp. 193-211, June 2005, at 201.

¹⁵⁸ *Id.*

¹⁵⁹ Samuel E. Logan, “*The Proliferation Security Initiative: Navigating the Legal Challenges*,” JOURNAL OF TRANSNATIONAL LAW & POLICY, Vol. 14:2 Spring, 2005, pp 253-272. at. 270.

¹⁶⁰ *See supra* note 135 at 451.

Department of Defense, and the Department of State, who testified at the six hearings on UNCLOS held during the 108th Congress, clarified: that PSI is consistent with UNCLOS; that U.S. accession to the Convention would not present any difficulties for implementation of the Initiative; and that the United States becoming a party to UNCLOS would strengthen the interdiction efforts under the PSI.”¹⁶¹

3. Extant International Law and the PSI. UNCLOS is seen as the codification of the existing customary international laws of the sea and considered to be a “Constitution for the Oceans.”¹⁶² UNCLOS is tied to the fortunes of the PSI because it codifies laws that directly relate to PSI activities. For instance, one specific UNCLOS provision establishes what is known as flag-state sovereignty. Flag-state sovereignty requires all states to treat ships in international waters as if they were “part of a state’s physical territory, a sort of floating embassy.”¹⁶³

This particular provision in UNCLOS means that only the state whose flag is flying on the ship may interdict that ship in international waters, even if the ship is operated by a non-state actor. This means that states of proliferation concern such as North Korea and Iran can avoid interdiction and can transport WMD-related material by simply avoiding jurisdictional waters of states fighting WMD proliferation and by flying their own state’s flag.¹⁶⁴ Authorities state that there is nothing in UNCLOS that explicitly prohibits the possession or transportation of ‘WMD, their delivery systems, and related materials’ by a foreign-flagged vessel.¹⁶⁵ Flag-state sovereignty has weakened the language of many nonproliferation resolutions and treaties.¹⁶⁶ The global activities and resolutions created to deter the proliferation of WMD have been carefully worded so that they do not violate the principle of flag-state sovereignty.¹⁶⁷ Flag-state sovereignty is taken very seriously since all international actions must be legal under national and international laws.¹⁶⁸

A. The UNCLOS Dilemma. The United States asserts that the Proliferation Security Initiative is legal under international law and consistent with UNCLOS.¹⁶⁹ Yet, it is curious that the United States is not a signatory of UNCLOS, especially since the U.S. military sees benefits

¹⁶¹ See *supra* note 137 at 103.

¹⁶² *Id.* at 102.

¹⁶³ Muzinich, Justin, “The Nuke in the Cargo Hold”, Policy Review, August & September 2010, Issue 162, page 84.

¹⁶⁴ James Cotton, “The Proliferation Security Initiative and North Korea: Legality and Limitations of a Coalition Strategy,” SECURITY DIALOGUE, Vol. 36 Iss. 2, pp. 193-211, June 2005, page 197 and Justin Muzinich, “The Nuke in the Cargo Hold”, POLICY REVIEW, Aug. & Sept. 2010, Iss. 162, pp 83-92, at 86.

¹⁶⁵ Yann-Huei Song, “The U.S.-Led Proliferation Security Initiative and UNCLOS: Legality, Implementation, and an Assessment,” OCEAN DEVELOPMENT & INTERNATIONAL LAW, 38: 101-145 (2007) at 115. Timothy Martin, “Drawing Lines in the Sea”, U.S. NAVAL INSTITUTE PROCEEDINGS, December 2008, Vol. 134 Issue 12, p58-62.

¹⁶⁶ See *supra* note 138 at 86.

¹⁶⁷ *Id.*

¹⁶⁸ *Id.*

¹⁶⁹ See *supra* note 137 at 103 “Rice pointed out that the Initiative requires participating parties to act consistently with national legal authorities and “relevant international law and frameworks,” which includes the law as it is reflected in UNCLOS.”

in joining.¹⁷⁰ In fact, the U.S. is the only core PSI member, permanent UN Security Council member, and NATO ally that is not a party to the UNCLOS treaty.¹⁷¹ Many believe that if the United States joined UNCLOS, the PSI would actually gain more partners, intelligence, and preemptive actions to help protect against significant proliferation threats.¹⁷²

4. Strategies for an Inchoate Initiative. There are arguably at least two strategies behind the PSI. First, it can be identified as a long-term networking and consensus building approach. Second, it can be viewed as a plan for pre-emptive self defense.¹⁷³

A. PSI as a Network Building Strategy. The PSI was formed initially with very few partners, limited persuasive authority, and very limited reach. Rather than coming into existence as a force to be reckoned with, it was established as an emerging network ready and willing to accept new partners when ready and able to join. The Obama administration continues on this path. “The Obama administration’s aim is to make the program ‘an enduring effort’ without adding an international bureaucracy, according to the Pentagon official. ‘There’s a need to maintain the voluntary and flexible nature of what everybody signed up to,’ he said, ‘while providing some leadership.’”¹⁷⁴

The United States faced a clear choice in 2003 at the inception of the PSI –to propose a UN resolution that would have been mired in debate and controversy for years¹⁷⁵ or simply start a network from scratch with like minded states which is flexible and likely to build momentum. The PSI strategy was designed to gradually grow a network that increasingly denies non-state proliferators access to legitimate shipping venues¹⁷⁶ while building a demonstrable and working international norm. The timeline illustrates the initial success of the initiative in terms of membership growth.

See Diagram 1 on next page.

¹⁷⁰ See *supra* note 134 at 6-7.

¹⁷¹ See *supra* note 137 at 113.

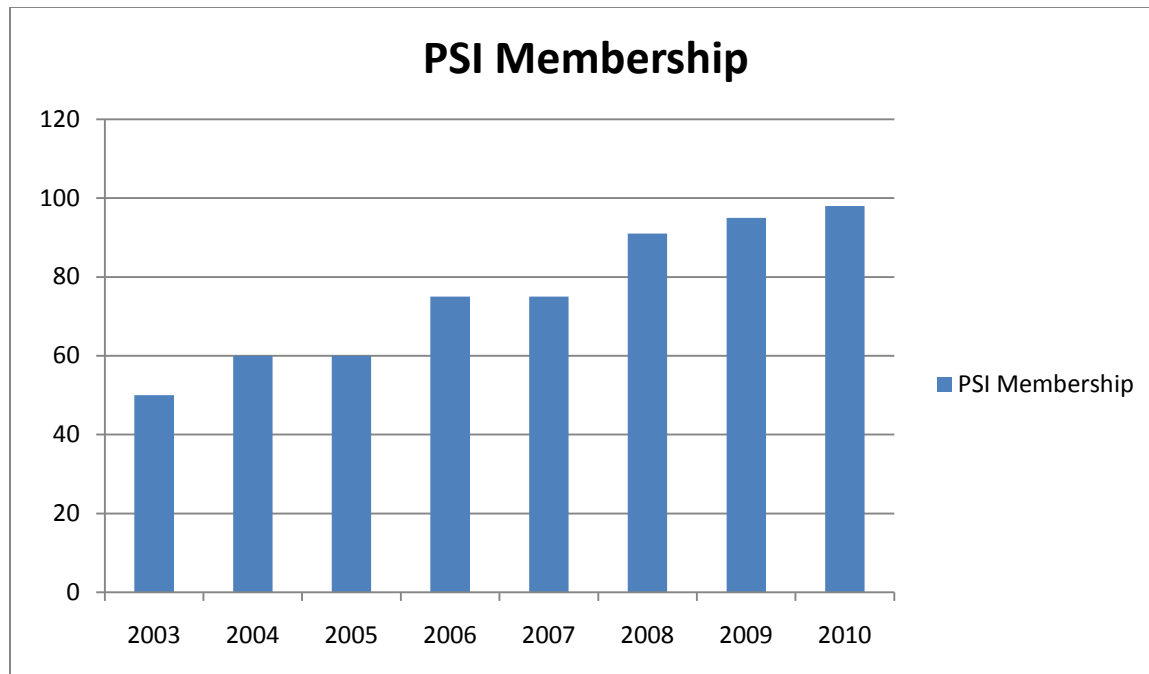
¹⁷² See *supra* note 135 at 451.

¹⁷³ See *Byers supra* note 148 at 541, “John Bolton, the architect of PSI, asserted on several occasions during the early stages of the initiative that an extending right of preemptive self-defense was part and parcel of it.”

¹⁷⁴ Lee Katz, “Counterproliferation Program Gains Traction, But Results Remain a Mystery”, 10 Dec. 2010, GLOBAL SECURITY NEWSWIRE, http://gsn.nti.org/gsn/nw_20101208_8526.php Last checked June 15, 2011.

¹⁷⁵ See *Byers supra* note 148 at 541, “The doctrine has, generally speaking, not received the widespread support needed to change customary international law.”

¹⁷⁶ Brett James Morash, “Intelligence Operations in Maritime Interdiction Operations and the Global War on Terrorism,” Naval War College, Newport, RI essay, May 17, 2004.



The extant PSI strategy provides a proof of concept and an immediate path to action for states that come to realize a favorable cost-benefit calculus with PSI membership. Notable cases on point include Russia with initial skepticism and South Korea with hesitation rooted in delicate relations with North Korea. Russia eventually decided to join after assessing the threat of proliferation of other states while they reduced arms.¹⁷⁷ In contrast, South Korea joined the maritime web after North Korea conducted its second nuclear test.¹⁷⁸ South Korea is now a PSI member despite the risk of raising tensions with North Korea since tensions had already grown to dangerous levels and the deterrent effects of PSI became worth the risk of upsetting the North.¹⁷⁹ In fact, a U.S. official recently capitalized on a fortuitous opportunity to “urge” Vietnam, Thailand, Indonesia and Malaysia to fully join the effort.¹⁸⁰ Senior officials from these states happened to be visiting Washington, D.C. on May 27, 2011 when the U.S. was in the midst of the interception of a ship flagged from Belize with suspected missile technology from North Korea en route to Myanmar.¹⁸¹ Belize, a member of the PSI, gave the U.S. permission to board the *M/V Light*, but the U.S. held off on forcibly boarding the ship. The ship eventually returned to North Korea with its cargo rather than risk U.S. forcibly boarding it.¹⁸² Clearly the

¹⁷⁷ See *supra* note 156.

¹⁷⁸ Editors, “Experts Meet Ahead of Naval Drills in S. Korea”, 13 October 2010, WASHINGTON TIMES.

¹⁷⁹ See *supra* note 174.

¹⁸⁰ See *supra* note 136.

¹⁸¹ *Id.*

¹⁸² *Id.*

PSI helped states' efforts to cooperate in this instance. The episode was considered a good example of international cooperation and coordination.¹⁸³

B. PSI as Preemptive Self-defense. Preemptive self-defense is undeniably part of the PSI strategy from its inception as indicated through comments by its architect John Bolton¹⁸⁴ and President Bush.¹⁸⁵ Although the concept of preemptive self-defense can be seen as controversial, there are circumstances where it would be lawful. For instance, interdiction of WMD on a ship would be lawful under Article 51 of the UN Charter if there was clear evidence that it was imminently going to be used in an attack.¹⁸⁶

C. Measuring Success. The PSI has developed successfully, but it is ultimately difficult to measure its success. There are, however, some indicators by which to measure PSI success. Key PSI milestones by which to monitor PSI progress include: a.) successful interdictions, b.) membership growth which denies proliferators of legitimate shipping opportunities,¹⁸⁷ or perhaps c.) the successful passage of UN resolutions that support the PSI as result of the leverage created by the growing network of states. Come the time the PSI may possibly be considered for formal adoption by the UN Security Council, the demonstration of a functioning international norm found in PSI could help provide considerable pressure to formally adopt a variant of the regime as international law. The PSI, however, may rightly be subject to criticism if it a.) fails to garner a critical mass of membership within a reasonable timeframe, b.) proves unpersuasive in demonstrating any normative response to WMD proliferation, or c.) ultimately fails to interdict WMD.

5. China and the PSI. Although China agrees with the principles of the Proliferation Security Initiative, China refuses to publicly endorse and officially become a participating member in the PSI.¹⁸⁸ China refuses to join the initiative because it “considers PSI interdictions illegal under international law.”¹⁸⁹ China's membership in PSI, however, is critical to the Initiative's efforts given the extensive history of China's WMD material proliferation. For decades, China was a major proliferator of various weapons and missiles that were allegedly supplying restricted North

¹⁸³ Editors, Seoul, AFP, “U.S. Intercepted N. Korea Ship Over Arms Fears,” June 13, 2011. Available at http://news.yahoo.com/s/afp/20110613/ts_alt_afp/usnkoreamyanmarmissilediplomacymilitaryship. Last checked June 16, 2011.

¹⁸⁴ See *Byers supra* note 16 at 541 “John Bolton, the architect of PSI, asserted on several occasions during the early stages of the initiative that an extending right of preemptive self-defense was part and parcel of it.”

¹⁸⁵ *Id* at 542, “President on Bush on February 7, 2004, where he went so far as to say: ‘I believe it is essential – that when we see a threat, we deal with those threats before they become imminent. It's too late if they become imminent. It's too late in this new kind of war.’”

¹⁸⁶ See *supra* note 138 at 85, “If there is clear evidence that a nuclear weapon is onboard a ship and will be imminently used in an attack, then a claim of self-defense, under Article 51 of the UN Charter, can be used to justify intercepting the ship.”

¹⁸⁷ See *supra* note 166.

¹⁸⁸ See *supra* note 137 at 106.

¹⁸⁹ See *supra* note 164.

Korean, Iranian, and Pakistanian weapons programs.¹⁹⁰ This type of behavior appears to have been slowed under U.S. pressure and newly implemented Chinese export control laws.¹⁹¹ Still, many are uncertain about Chinese commitment, interest, and participation in international endeavors to deter the spread of weapons of mass destruction. According to most U.S. officials, China rarely works towards stopping proliferation from occurring on its territory¹⁹² Some believe the longer China, a major world power, refuses to participate in the PSI activities, the longer rogue nations, such as North Korea and Iran, will flout U.N. Security Council resolutions and global treaties designed to stop WMD proliferation.¹⁹³

A. Contradictions in Chinese Policy. China has stated that it is reluctant to join the PSI since it doubts that the initiative is lawful.¹⁹⁴ China was also instrumental in making sure that UNSCR 1540 language did not allow for interdiction consistent with the PSI.¹⁹⁵ Yet, China is a member of the Global Initiative to Combat Nuclear Terrorism (GICNT) which is actually based on the PSI.¹⁹⁶ China's contradictory position begs many questions. The apparent contradictions, however, might be reconciled if the Chinese happen to view the GICNT as a paper tiger which merely focuses on, "workshops, seminars, and exercises that result in the sharing of best practices and lessons learned on a variety of topics."¹⁹⁷

It is most likely that China is against the PSI since it would likely interfere with the commercial interests of private Chinese firms that engage in controversial dual use or proliferation related business. It appears that the prevailing view at present is that China is merely turning a blind eye to Chinese businesses engaging in proliferation related activities by failing to enforce export laws¹⁹⁸ rather than willfully supporting proliferation activities.¹⁹⁹

¹⁹⁰ John Pomfret, "U.S. Asked China to Stop Missile Parts Shipment to Iran", 29 November 2010, WASH. POST.

¹⁹¹ *Id.*

¹⁹² *Id.*

¹⁹³ Editors, "Obama Presses China to Curb North Korea", 6 December 2010, Global Security Newswire.

¹⁹⁴ See *supra* note 164, "Beijing fears that signing on to the program would imply 'you would allow the U.S. to undertake such actions as necessary in your waters. And that's the last thing that China wants.'" "China says its refusal to participate is based on the fact that it considers PSI interdictions illegal under international law."

¹⁹⁵ See *supra* note 174 at 6. "While UNSCR 1540 was adopted under Chapter VII of the UN Charter, the resolution did not provide any enforcement authority, nor did it specifically mention interdiction or PSI. Early drafts of the resolution put forward by the United States had included explicit language calling on states to interdict if necessary shipments related to WMD. However, over China's objections, the word 'interdict' was removed and was changed to 'take cooperative action to prevent illicit trafficking' in WMD."

¹⁹⁶ David E. Sanger, "U.S. and Russia Will Police Nuclear Terrorists," NY TIMES.COM, July 15, 2006. "The Global Initiative to Combat Nuclear Terrorism.' The informal organization of countries is based on the American-led 'Proliferation Security Initiative,'

¹⁹⁷ U.S. Department of State, FAQ, <http://www.state.gov/t/isn/c37072.htm>. Last checked February 23, 2011.

¹⁹⁸ See *supra* note 180. "Secretary of State Hillary Rodham Clinton continued to pressure China on proliferation issues, this time because it was apparently turning a blind eye to its own companies."

"China passed export control laws, but Beijing has rarely, according to U.S. officials and the cables revealed Sunday, actively worked to stop proliferation from occurring on its territory."

¹⁹⁹ Editors, "North Korean Uranium Plant Stokes Proliferation Worries", 24 __ 2010, GLOBAL SECURITY NEWSWIRE [12] Last Checked 26 November 2010. "Pyongyang might have used China -- North Korea's historic

6. North Korea and the PSI. North Korea has a complex relationship with the PSI. On one hand the threat of North Korea's proliferation activity provided significant inspiration for the initiative. On the other hand, the PSI does not provide any new authority to interdict North Korean ships. The PSI does arguably have an effect on North Korean proliferation on at least two points: 1.) through international pressure to add transparency to their shipping practices, and 2.) through pressure from a global interdiction network that is ready, willing, and able to act if the authority is present, as demonstrated in the recent *M/V Light* interception.²⁰⁰

A. North Korean Proliferation Activities. North Korea is regarded as the "world's foremost proliferator of ballistic missiles and related technology to rogue states and hostile regimes."²⁰¹ It has been argued that North Korea views proliferation as an essential revenue source to fund the nation's WMD and missile programs.²⁰² It is believed that North Korea, impoverished by international sanctions,²⁰³ is aiding foreign governments such as Iran and Syria and terrorist groups including Hamas and Hezbollah²⁰⁴ in order to fund Kim Jong Il's nuclear weapons program.²⁰⁵ In addition, U.S. intelligence has suggested nuclear and missile cooperation between North Korea and Iran²⁰⁶ which could potentially lead to a new arms race in each of their regions.²⁰⁷ Thus the proliferation activities of North Korea – which include "selling drugs, counterfeit dollars and missiles" – makes it a prime target for PSI interceptions under the right circumstances.²⁰⁸

It has been asserted that North Korean flagged vessels will be the ships most likely subject to stop-and-search tactics.²⁰⁹ But as the *M/V Light* incident demonstrated the U.S. was reluctant to forcibly board the ship even though it had lawful authority from Belize to do so. U.S. hesitation was attributed to concern that it could "ignite the Korean Peninsula."²¹⁰ Thus, it

ally and main economic benefactor -- as a midshipment location for acquiring prohibited enrichment machinery, the Washington-based Institute for Science and International Security said in an October report."

"Nothing suggests Beijing is 'secretly approving or willfully ignoring exports' that would bolster the North's military nuclear effort, according to the report."

²⁰⁰ See *supra* note 136.

²⁰¹ See *supra* note 137 at 110.

²⁰² Editors, "*The Proliferation Security Initiative: A Model for Future International Collaboration*", 15 June 2009, Fairfax, VA: National Institute Press, 395-462, at 397.

²⁰³ Editors, "*North Korean Uranium Plant Stokes Proliferation Worries*", 24 __ 2010, GLOBAL SECURITY NEWSWIRE [12] Last Checked 26 November 2010.

²⁰⁴ Michael Gordon, and Andrew Lehren, "*U.S. Strains to Stop Arms Flow*", 6 Dec. 2010, NYT [16] Last Checked 12 December 2010.

²⁰⁵ See *supra* note 137 at 110.

²⁰⁶ William Broad et al., "*Iran Fortifies Its Arsenal With the Aid of North Korea*", 28 Nov. 2010, NYT [14] Last Checked 2 December 2010.

²⁰⁷ Editors, "*Obama Presses China to Curb North Korea*", 6 Dec. 2010, GLOBAL SECURITY NEWSWIRE[17] Last Checked 23 December 2010.

²⁰⁸ Editors, "*Practicing to Provoke*", THE ECONOMIST, 20 Sept. 2003, Vol. 368, Iss. 8342.

²⁰⁹ See *Supra* note 157 at 197.

²¹⁰ See *supra* note 136.

is likely that North Korean ships will either fly their state's flag²¹¹ and/or try to avoid state jurisdictions where their proliferation activities may be subject to investigation.²¹²

B. The Need for South Korea and China in the PSI. China and South Korea have strategic relationships with North Korea. China is seen historically as North Korea's ally and main economic benefactor,²¹³ while South Korea is becoming North Korea's most important trading partner.²¹⁴ Thus, pressure against North Korea's proliferation activities would arguably increase if China joined the PSI alongside South Korea and other countries. Fortunately, South Korea has become a major partner to the initiative²¹⁵ and the US also has air and naval units that could be used in PSI operations based on South Korean territory.²¹⁶

Unfortunately, North Korea continues to openly defy the international community by aggressively pursuing WMD and longer-range missiles²¹⁷ and disobey U.N. Security Council Resolutions²¹⁸ designed to restrain their proliferation activities. North Korea even went so far as to threaten war in retaliation to PSI interdictions.²¹⁹ Therefore the PSI clearly has a long way to go before it can be considered a success. But it can be argued, however, that the bilateral cooperation made possible by the PSI in the recent *M/V Light* incident was enough to successfully counter bold defiance against the international community and the most ominous of threats. Thus, it is safe to say that the PSI has potential for continued success with continued growth of initiative.

²¹¹ See *supra* note 138 at 85.

²¹² See *Supra* note 157 at 197.

²¹³ Editors, "North Korean Uranium Plant Stokes Proliferation Worries", 24 __ 2010, GLOBAL SECURITY NEWSWIRE [12] Last Checked 26 November 2010.

²¹⁴ See *Supra* note 157 at 206-207.

²¹⁵ See *supra* note 164.

²¹⁶ *Id.*

²¹⁷ Editors, "The Proliferation Security Initiative: A Model for Future International Collaboration", 15 June 2009, Fairfax, VA: National Institute Press, 395-462, at 397.

²¹⁸ Editors, "Obama Presses China to Curb North Korea", 6 Dec. 2010, GLOBAL SECURITY NEWSWIRE[17] Last Checked 23 December 2010.

²¹⁹ See *supra* note 164.

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