Presentation by Milton Leitenberg* to the US National Academy of Sciences, Institute of Medicine, FORUM ON MICROBIAL THREATS

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BOTULINUM TOXIN: THE LINKAGE WITH BIOTERRORISM

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1. Introduction

- ► Background of the decade 1995-2005
- ► This presentation does not emphasize vulnerabilities. It is essentially a classical threat assessment, an identification and evaluation of real-world entities, their parameters, performance, experiences, capabilities.

2. "Agroterrorism"

- ► Monterey Institute, 2 tables
- ► CRS, 2004: non-sequiter
- ► Fry/Cornell, 2000 – No evidence that any terrorist group was "thinking like a terrorist"

3. The Botulinum Toxin Terrorist Record

- ► Red Army Faction, Paris, 1970s: Untrue
- ► Aum Shinrikyo, Tokyo, 1990-1994: Untrue
- ► Comparison with 2 papers in the prepared material for the NAS Forum on Microbial Threats
- ► Al Queda, Afghanistan, 1997-98 to 12/2001: No apparent production, no known evidence of pathogen acquisition

4. Botulinum Toxin

- ► Description and historical record of preparation by national BW programs: strains, toxin production, requirements, and complexity

5. The Wein/NYT and PNAS Publications and Critique

- ► The "Jihadi manual"
- ► False assumptions are not correctable by mathematical calculations
- ► The three key variables
- ► Wein's conclusions inherently contradictory, possibly inaccurate by nine orders of magnitude, reducing the possible outcome from predicted large mortality to zero

Comments on two Monterey Institute Center for Nonproliferation Catalogues on "Agroterrorism"

#1. "Chronology of CBW Attacks Targeting Crops and Livestock, 1915 – 2000; Chronology of Attacks and Incidents

18 Events are listed over a period of 85 years. Of these:

- Three are false allegations.
- Three are "threats." As best as is known, they were more accurately bluffs.
- One could be considered "murder" of a neighbor's animals.
- One is unsubstantiated (Alabama, US).
- One is a very low-scale "economic" (Wisconsin, US).
- Two, both Israeli, are low-scale economic.
- One, US/Korean DMZ, was herbicide use to clear the DMZ to impede infiltrations; no anti-crop function.

Summary: 12 of the 18 are NOT what they are claimed to be. At a minimum, the captions should have read "Attacks, Incidents, False Allegations and Bluffs."

#2. "Agricultural Biowarfare: State Programs to Develop Offensive Capabilities"

1. Entry for Egypt: Source is Shoham; 100% unreliable.
2. Entry for Iraq: The anthrax was intended as an anti-human agent, not for use against animals. The camelpox was a research simulant. According to UNSCOM and UNMOVIC, there was no evidence ever found of work on Foot and Mouth disease in the BW program.
3. Entry for Rhodesia: Allegation of anthrax use: the outbreak was of natural origin; not due to government action.
4. Entry for South Africa: The anthrax was for use against humans; no evidence that it was ever intended or used against animals.
5. Entry for Syria: Source is Cordesman; would have to be checked for primary source.
6. Entry for Russia/USSR: Adds Kazakhstan and Uzbekistan. There is no justification for that. The facilities in those countries belonged to Soviet-era BW program, and there is no presumption that BW-relevant work continued in them once the two new states became independent in 1992, though the facilities continued to exist.
7. Entry for UK: The year of offensive BW program termination is known.
8. If North Korea has an offensive BW program, and if it includes anthrax that would in all likelihood be intended for anti-human use.

Summary: Of entries for 13 countries, 3 are totally incorrect and 5 others have varying degrees of inaccuracy. Only 5 can stand as they are.

Sidell, Takafuji and Franz, *Medical Aspects of Chemical and Biological Warfare*, 1997, p. 463.

"A laboratory in a safe house of the Red Army Faction in Paris, France, was found to have made quantities of botulinum toxin; it is believed that none was used."

Their source was Brad Roberts, *Biological Weapons: Weapons of the Future?*, Washington, DC: The Center for Strategic and International Studies, 1993.

"Red Army Faction" refers to the West German Baader-Meinhof Group. The German BND [intelligence agency] had always – privately – said that this was untrue. Nevertheless, numerous US analysts and some US government officials persisted in claiming for two decades that this "event" had occurred.

Asahi Shimbun, May 24, 1996, reporting on evidence presented by the Japanese prosecutor:

"A group led by Seiichi Endo tried to culture Botulinum, but failed in isolating the germ. Then…Hideo Murai installed a big tank in order to make a large-scale production of the germ. After all, the facility was not accomplished to produce germs."

Decision of the Public Security Commission of the Public Security Investigation Agency [Japan], January 31, 1997:

"The Aum had failed to isolate Clostridium botulinum."

Full report, *Production of Biological (Bacteriological) Weapons by the Organization*, is classified, but the decision is available.

Chief Toxicologist, Chiba Prefecture (Tokyo), February 1998 [personal communication]:

"The group had not been sufficiently competent to succeed [in their effort] to produce biological agents."

Subj: **Re:**
Date: 10/18/2005 8:25:54 AM Eastern Daylight Time

Dear Milton,

As far as I know, there is NO publicly available information that the Aum had successfully obtained a strain of Clostridium botulinum.

You might know, according to the prosecutors' opening statement at Asahara's trial (Tokyo District Court, May 23, 1996).

(1) Tomomasa Nakagawa taught Asahara about the toxicity of botulinum toxin.

(2) Asahara asked Sei-ichi Endo to isolate and cultivate Clostridium botulinum.

(3) Endo, together with Kiyohide Hayakawa and Tomomitsu Niimi, went to Hokkaido to collect soil for that purpose.

(4) But Endo FAILED [in] isolating Clostridium botulinum.

In this statement, prosecutors have NEVER said that the Aum had successfully obtained (bought, steal etc.) a strain of Clostridium botulinum.

Best regards,

Masaaki Sugishima
School of Law, Asahi University

Kaplan and Marshall’s book, and Kaplan’s paper, rely on three Japanese National Police Agency reports from 1995 and 1996. They are contradicted by all of the above. The presumption is that the Japanese police reports are not reliable, and are derived from witness misstatements.

The lengthy report by the Counsels [Sopko and Edelman] of the US Senate Committee on Governmental Affairs in 1995 relies on the same National Police information.

A detailed description of the efforts of the Aum group to produce biological agents became available in 1999 and 2000 in three publications by Milton Leitenberg:

1. "The Experience of the Japanese Aum Shinrikyo Group and Biological Agents," in *Hype or Reality: The "New Terrorism" and Mass Casualty Attacks*, pp. 159-172 in Brad Roberts, ed. (Alexandria, VA: Chemical and Biological Arms Control Institute, 2000).

2. "Aum Shinrikyo's Efforts to Produce Biological Weapons: A Case Study in the Serial Propagation of Misinformation," pp. 149-158, in Max Taylor and John Horgan, ed., *The Future of Terrorism* (London: Frank Cass, 2000).

3. "Aum Shinrikyo's Efforts to Produce Biological Weapons: A Case Study in the Serial Propagation of Misinformation," *Terrorism and Political Violence* [Special Issue on the Future of Terrorism] 11:4 (Winter 1999), p. 149-158.

Papers in the NAS Conference Materials with References to Production of Botulinum Toxin and Other BW Agents by States and by Non-state Actors/Terrorists

1. In Section #4: Sobel, Khan, Swerdlow (CDC), *Lancet*, 2002.

2. In Section #6: Arnon et al., for the Hopkins/Pittsburgh Working Group on Civilian Biodefense, *JAMA*, 2001.

Sobel, Khan, Swerdlow, "Threat of a Biological Terrorist Attack on the US Food Supply: The CDC Perspective," *Lancet*, vol. 359 (March 9, 2002).

"Aum Shinrikyo…reportedly has produced stocks of botulinum toxin and other biological agents" [page 825].

The source for this statement was the Kadlec, Zelicoff and Vrtis chapter in Joshua Lederberg's book, MIT Press, 1999. Their source in turn was Kaplan and Marshall's 1996 book on the Aum, which is nearly 100% inaccurate in ***all*** its discussion of the Aum's work on biological agents, except that such work was carried out, and that numerous attempts to distribute the products [innocuous, non-pathogenic and non-toxic in the case of biological materials] were attempted by the group.

- The Aum produced no "stocks" of Botulinum toxin. At first it appeared either that they had obtained a strain that produced no toxin or that they had not succeed in producing any. It now appears certain that they never obtained a strain of Clostridium botulinum.
- The Aum produced no "other biological agents," specifically anthrax, because they only had the Sterne vaccine strain of anthrax, and in addition they did not work with it properly.
- The Aum had no "other biological agents" of any kind.

By the end of 1999 – and therefore certainly by 2002 – there was a publication available in three separate locations which explained the above as well as additional inaccuracies which by then had appeared in print in every discussion of the Aum and BW, and as the previous examples indicate, continue to appear in print.

Arnon et al, "Botulinum Toxin as a Biological Weapon," *JAMA* 285:8 (February 28, 2001), pp. 1059-1070

"Terrorists have already attempted to use botulinum toxins as a bioweapon…by the Japanese cult Aum Shinrikyo. These attacks failed, apparently because of faulty microbiological technique, deficient aerosol generating equipment, or internal sabotage. The perpetrators obtained their C. botulinum from soil that they collected in northern Japan."

[One source is again Kaplan, his chapter on the Aum in J. Tucker (ed.), *Toxic* Terror, 2000, and the second is a 1998 *New York Times* article.]

"Four of the countries listed by the US government as 'state sponsors of terrorism' (Iran, Iraq, North Korean and Syria) have developed, or are believed to be developing, botulinum toxin as a weapon.

[Sources are Cordesman (1998) and Bermudez (2001).]

- ❑ In the statement on the Aum group, both sources used are not reliable as regards information they contain on Aum and BW.
- ❑ As indicated in the previous, it appears that the Aum did not succeed in isolating C. botulinum from soil, or obtaining it in any other way.
- ❑ As regards the other countries, the US government does not claim to know which specific BW agents the countries listed may be developing.
- ❑ The Russian government's 1993 FSB (intelligence) report does not list botulinum toxin among the four BW agents that it claimed North Korea was working with.
- ❑ Official US government statements consider it highly unlikely that BW or CW would be included in state assistance to terrorist groups. It has never happened to date despite three to four decades of state assistance to terrorist groups by states which do, or may, possess both BW and CW, and which have assisted terrorist groups in every other conceivable manner.

Roger Shapiro (CDC), "Botulism Surveillance and Emergency Response: A Public Health Challenge for a Global Challenge, *JAMA* 278:5 (August 6, 1997), pp. 433-435.

- *"…reports that national governments and terrorist groups have stockpiled botulism toxin."*

  NO "terrorist group" is known to have "stockpiled botulism toxin" to date.

- *"As many as 17 countries are suspected of either including or developing biological agents in their offensive weapons programs; botulism toxin is frequently one of these agents…."*

  According to official US government tallies, the number has never been alleged to exceed 13. As of mid-2005, it had been reduced by three or four, again according to US government statements. Only Iraq is known to have produced and stockpiled Botulinum toxin.

- *"The Aum Shinrikyo cult in Japan also produced botulism toxin…."*

  They produced no toxin, and they did not have the organism.

- *"Instructions for the production of botulism toxin have been broadcast on the Internet as well."*

  Virtually all the "instructions…on the Internet" are useless, excluding professional journal papers that may be available on-line.

Journal papers dealing with Clostridium Botulinum in the Possession of Al Queda in Afghanistan Prior to December 2001

[Other papers concerned Anthrax, Plague and Hepatitis A]

1. T.A. Roberts, “Sporulation of Clostridium Botulinum Type E in Different Culture Media,” *Journal of Applied Bacteriology* 28:1 (1965), pp. 142-146.

2. C. Hobbs, T.A. Roberts, and P.D. Walker, “Some Observations on OS Variants of Clostridium botulinum Type E,” *Journal of Applied Bacteriology* 28:1 (1965), pp. 147-152.

3. T.A. Roberts et al, “The Resistance of Clostridium botulinum Type E to Heat and Radiation,” *Journal of Applied Bacteriology* 28:1 (1965), pp. 125-141.

4. 1 page extract of a handbook on Gram Positive Bacteria, on Clostridium tetani.

5. 4 page extract of medical or microbiological handbook on Clostridium tetani and Clostridium botulinum.

The Botulinum Toxin in Milk Scenario

1. Lawrence M. Wein, “Got Toxic Milk,” *New York Times*, May 30, 2005

2. Lawrence M. Wein and Yifan Liu, “Analyzing a Bioterror Attack on the Food Supply: The Case of Botulinum Toxin in Milk,” *PNAS*, 102:28 (July 12, 2005): 9984-9989.

Issues Regarding Preparation of the Toxin, and Calculations of its Effect

1. The “Jihadi Manual”: Who is it proposed will, or can, do this?

2. Sources used for the model’s input: poor, incorrect, or should have been present, but were omitted.

3. Variability within three identified variables may accumulate over nine orders of magnitude variation in the predicted dose reaching milk consumer.

The Three Variables: Botulinum Toxin in Milk Scenario

"In closing, it is important to stress that several elements of the model contain enough irreducible uncertainty to preclude estimating the impact of the attack to within several orders of magnitude…

"The dose response curve, pasteurization inactivation rate, and terrorists' release size capabilities EACH contain several orders of magnitude of uncertainty.

…

"Taken together, we have a reasonably accurate estimate of the number of people who could be poisoned but a very poor estimate of how much toxin is required to cause a large outbreak."

Wein, *PNAS*, p. 9988-89

The first and last lines are inherently contradictory, and the last line appears to be internally contradictory.

Dr. Bruce Alberts [President, National Academy of Sciences, *PNAS*, July 12, 2005, p. 9737] re: Botulinum Toxin in Milk Scenario

"The Wein and Liu article has been widely circulated in preprint form, generating a great deal of discussion. For this reason, we are already aware of scientists who plan to publish challenges to some of its conclusions. This type of give-and-take lies at the heart of scientific progress and is precisely why scientific analyses are made available in the open literature."

"…scientists who plan to publish challenges…" referred to the critique by Milton Leitenberg and Dr. George Smith:

- ❑ *PNAS* declined to publish the critique.
- ❑ The *New York Times* declined to publish the critique.
- ❑ *Nature* declined to publish the critique.
- ❑ The *Washington Post* declined to publish the critique.

CONCLUSIONS

- The degree of inaccuracy in published information in the scientific community regarding the past record and feasibility of bioterrorism by essentially untrained true terrorist organizations is atrocious: for scientists, this should be considered a scandalous situation.

- Much of the same information continues to grossly exaggerate, to misinform and by suggesting the relative ease and feasibility of producing biological weapon agents, provokes interest among potential actors, state and non-state to investigate BW, which they might otherwise not have considered. The al Queda experience is a case in point: it was explicitly provoked by the bioterrorism furor in the United States in 1996-1997.

  Memorandum of April 15, 1999 by Dr. Ayman al-Zawahiri, deputy to Osama bin Laden:

  "We only became aware of them [biological weapons] when the enemy drew our attention to them by repeatedly expressing concerns that they can be produced simply with easily available materials."

- It is desirable and legitimate to explore vulnerabilities and to improve defense, but there is no justification for imputing to real world "terrorists" capabilities that they do not possess.

RECOMMENDATION

The US has appropriated $30 billion since FY 2002 – in four years – towards bioterrorism prevention. All further funding for “select agent” programs should be cancelled. Future funding should be split between public health programs such as described in the presentation by Dr. Robert Tauxe to the Forum on Microbial Threats, and to preparations in anticipation of an H5N1 pandemic influenza outbreak.

The former should include increased earmarked funding for state and county public health bodies to enable them to carry out the specified programs.

The latter should include the construction of a National Influenza Vaccine Facility as well as a dedicated national pharmaceutical facility for the production of anti-influenza pharmaceuticals. These two dedicated facilities would be rented to commercial entities in the same way that production facilities for weapons were built by the federal government and rented to manufacturers during World War II, and for a very large portion of the post-WWII period.

The vaccine facility should be prepared to produce an H5N1 vaccine. In all other years of operation, it could produce the required US quota of influenza vaccine to cover annual needs, so that no shortfalls would continue to occur. [Annual flu mortality in the United States ranges from 22,000 to 80,000+.]