Bridging Gap between Biomedical Research and Security Demands

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Medical Ethics

The AAAAI Ethics/Conflict of Interest Committee provides these quarterly discussions as a way to open a dialogue on the various ethical issues that confront our specialty on a daily basis. The articles should not necessarily be viewed as the committee's or the AAAAI's particular stance on an issue.

The Threats

Current bioterror threats include the use of bacteria, viruses and toxins. Genetically engineered microorganisms and possibly antibiotic and vaccine resistant pathogens pose additional serious threats. The study of open medical literature demonstrates another potential use of other significant biological agents such as prions and bioregulators.

Horrific future directions of research and development might lead to the utilization of genetically targeted agents, an offense which may target genetically unique populations. Similar simple non-confidential analysis might be done for current and future chemical or radioactive agents.

Also to be considered is the easy acquisition of dual use equipment, substances and acquisition or leakage of relevant academic knowledge to terrorist groups. In fact, a knowledge level equivalent to that of a bioscience MSc or PhD is all that is necessary for bioweapons production. The facilities needed are very simple; the space required is small; and equipment or reagents are relatively cheap. It is hard to distinguish between an innocent pharmaceutical laboratory and a bioweapons production facility. Kathleen Bailey, former Assistant Director of the U.S. Arms Control and Disarmament Agency has estimated that a major biological arsenal could be built in a room 15 feet square with only $10,000 worth of equipment.

Scientific journals are an excellent and reliable source of knowledge and may often function as a "cook book" for terrorists choosing to utilize weapons of mass destruction (WMDs). Such publications are meticulously peer reviewed, materials and methods are thorough, results are detailed, future tracks are suggested in the discussion section and all is supported by relevant references. Numerous examples are available for the potential abuse of open scientific data and resources. An article[1] stating that terrorists can kill more than 400,000 people by putting as little as 10 grams of botulinum toxin in a milk truck was pulled from publication in May 2005. Soon after on June 27[2], the article was released for publication with no changes.

In another alarming example, a group ordered pieces of commercially available poliovirus DNA sequence. The group had demonstrated that it was possible to reconstruct them as a complete DNA chain, adequate to produce active poliovirus pathogen[3]. Another publication states the optimal environmental conditions and meteorological conditions for the spread of aerosol and particles[4]. The last provides expert-based guidelines for a bioweapon or chemical weapon attack.

The Aum Shinrykio cult in Japan spread the home made nerve agent sarin in Matsumoto and Tokyo underground stations and rails. These attacks induced a small number of fatalities as well as thousands of injuries. This terror group also dispersed (with no clinical visible effects) anthrax spores and botulinum toxin. Early attempts to assemble simple nuclear devices were only learned later. These premature attempts were disclosed after the arrest and interrogation of some of the cult leaders, following the overt nerve agent attacks[5].

The Hopes

The academic world is extremely different from the security environment. The academic setup is characterized by openness, peer-review processes, academic freedom, the attitude of "publish or perish" and transparency. On the other hand, the security establishment is typically confidential, covert and cautious, with research and development being customer-oriented and guided.

Because of the potential lethality of and easy accessibility to some WMDs, the scientific and security communities must work together. First, mapping of potential areas in which plausible dual usage of knowledge may exist should be done. From these fields of research, responsible approaches should be developed. Indeed, some prestigious biomedical journals have adopted special approaches for review such as careful additional evaluation of articles dealing with selected agents, for instance those included on the Center for Disease Control and Prevention (CDC) list of dangerous pathogens, or further review by an external group of terrorism experts.

The potential cooperation must exceed the areas of possible friction. We believe that, as scientists, we play an essential part in the fight against terrorism through our role as researchers, educators, sentinels and responders. Enrichment of these responsibilities are achieved through enhanced perception of commitment, communication, compliance, education, the seeking of additional expert views when necessary, vigilance and augmentation of workplace safeguards.

Footnotes

1 Wein LM and Liu Y. (2005). Analyzing a bioterror attack on food supply: The case of botulinum toxin in milk. Proceedings of the National Academy of Sciences, 102:9984-9989.

2 MacKenzie, Debora. (2005, June 29). Milk supplies at risk from terrorist toxin. NewScientist. Retrieved August 1, 2008, from http://www.newscientist.com.

3 Cello J., Paul V. and Wimmer E. (2002). Chemical synthesis of poliovirus cDNA: Generation of infectious virus in the absence of natural template. Science, 297:1016-1018.

4 Spencer RC and Lightfoot NF (2001). Preparedness and response to bioterrorism. J Infection; 43:104-110.

5 Muilins, M.R. (1997). Aum Shinrikyo as an apocalyptic movement. In T. Robbins & S.J. Palmer (eds.) Millennium, Messiahs, and Mayhem. New York: Routledge.