IV. Chemical and biological warfare prevention and response

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In 2011 further details regarding the 'anthrax letter' investigation in the United States, which began in October 2001 and was conducted by the US Federal Bureau of Investigation (FBI), were released.[1] Discussions focused on how the Department of Justice had determined that Bruce E. Ivins, a US Army scientist, was responsible for the letters and acted alone. The Department of Justice found that Ivins's psychiatric history provides 'considerable additional circumstantial evidence' that he was guilty. However, the US National Academy of Sciences issued a report that concluded 'It is not possible to reach a definitive conclusion about the origins of the *Bacillus anthracis* in the mailings based on the available scientific evidence alone'.[2] The US Congress will continue to consider this matter in 2012.

In 2011 the United Nations Office for Disarmament Affairs and the UN Secretary-General concluded a memorandum of understanding (MOU) with the World Health Organization (WHO) concerning the the Secretary-General's authority to investigate alleged use of chemical and biological weapons (CBW).[3] Other MOUs with the World Organisation for Animal Health (OIE) and the Organisation for the Prohibition of Chemical Weapons were still being negotiated.

In August 2011 the Working Group on Preventing and Responding to Weapons of Mass Destruction Attacks, which had taken on some of the activities of the Counter-Terrorism Implementation Task Force in support of the 2006 UN Global Counter-Terrorism Strategy, called for enhancing coordination between all relevant international actors and strengthening response capacities at regional, national and local levels.[4] The report concluded that, while lead international agencies for dealing with nuclear and

[1] Guillemin, J., *American Anthrax: Fear, Crime, and the Investigation of the Nation's Deadliest Bioterror Attack* (Times Books: New York, 2011).

[2] Amerithrax Expert Behavioral Analysis Panel, *Report of the Expert Behavioral Analysis Panel* (Research Strategies Network: Vienna, VA, 2011), p. 2; and National Research Council, *Review of the Scientific Approaches Used during the FBI's Investigation of the 2001 Anthrax Letters* (National Academies Press: Washington, DC, 2011), p. 4. See also US Public Broadcasting Service, 'The anthrax files', *Frontline*, 11 Oct. 2011, <http://www.pbs.org/wgbh/pages/frontline/anthrax-files/>.

[3] United Nations, Counter-Terrorism Implementation Task Force (CTITF), *Interagency Coordination in the Event of a Terrorist Attack using Chemical or Biological Weapons or Materials* (United Nations: New York, Aug. 2011), para. 152; and United Nations, Office for Disarmament Affairs, 'Memorandum of Understanding between the World Health Organization and the United Nations concerning WHO's support to the Secretary-General's mechanism for investigation of the alleged use of chemical, biological or toxin weapons', 31 Jan. 2011, <http://www.un.org/disarmament/WMD/Secretary-General_Mechanism/>.

[4] The UN Global Counter-Terrorism Strategy and its Plan of Action are contained in UN General Assembly Resolution 60/288, 20 Sep. 2006.

radiological threats are readily identifiable, organizations with responsibility for CBW threats are more diffuse and characterized by having 'partial mandates' in the various activities associated with prevention, preparedness and response.[5]

In 2011 the US Trade & Aid Monitor blog released primary documents and information on planned environmental remediation activity to clean up the after-effects of the US use of defoliants in Viet Nam in the 1960s and early 1970s.[6]

Scientific research

In late 2011 two research groups, one in the USA and the other in the Netherlands, released preliminary results of work to modify the virulence of the A(H5N1) strain of the avian influenza virus. Biosafety and biosecurity concerns led the US National Science Advisory Board for Biosecurity (NSABB) to request, for the first time since the body began to meet in 2005, that the researchers withhold part of their research findings from publication.[7] The NSABB's authority in the matter derives from the fact that both research groups have received funding from the US National Institutes of Health.

At the Fourth European Scientific Working Group on Influenza (ESWI) in September 2011, Dr Ron Fouchier of the Dutch Erasmus Medical Centre, who leads one of the two research groups, presented findings that show how a modified avian influenza virus strain became readily transmissible among ferrets, the animal model that Fouchier was using to study human infections.[8] The second research group is led by Dr Yoshihiro Kawaoka of the University of Wisconsin and the University of Tokyo. Fouchier's group submitted its research to *Science*, while Kawaoka's group submitted its work to *Nature*. The editorial board of *Nature* indicated that it would consult with the researchers concerning the NSABB's request.

This research exemplifies the growing ability of scientists to manipulate and create pathogens with novel characteristics. The NSABB reviewed the draft research and stated that neither manuscript should be published in its

[5] United Nations, Counter-Terrorism Implementation Task Force (note 3).

[6] 'Da Nang Agent-Orange/dioxin technical documents obtained', US Trade & Aid Monitor blog, 23 May 2011, <http://www.tradeaidmonitor.com/2011/05/da-nang-agent-orangedioxin-technical-documents-obtained.html>.

[7] As of 5 Jan. 2012, 576 cases of A(H5N1) infection had been reported to the WHO since 2003, and 339 of those infected had died. The mortality rate, *c.* 50%, is perhaps too high because it is possible that some proportion of those infected went unreported, partly because they recovered without being tested. World Health Organization (WHO), 'Cumulative number of confirmed human cases for avian influenza A(H5N1) reported to WHO, 2003–2011', <http://www.who.int/influenza/human_animal_interface/H5N1_cumulative_table_archives/en/index.html>.

[8] European Scientific Working Group on Influenza (ESWI), Fourth ESWI Influenza Conference, Malta, 11–14 Sep. 2011, <http://www.eswiconference.org/>.

entirety 'with complete data and experimental details', and that text should be added to describe, among other things, (*a*) the goals of the research, (*b*) the potential health benefits, (*c*) the risk assessments carried out prior to the start of the research, (*d*) the biosafety oversight and related measures, (*e*) the biosecurity practices and the facilities' 'adherence to select agent regulation', and (*f*) text 'addressing biosafety, biosecurity, and occupational health [that] is part of the responsible conduct of all life sciences research'. It is less clear how the adherence of facilities to select agent regulation would apply to non-US entities that receive US grants. However, the harmonization of such standards internationally is a broader policy objective within, for example, the framework of the Australia Group. The NSABB also stated that the US Government should 'encourage the authors to submit a special communication/commentary letter' to the journals 'regarding the dual use research issue'.[9]

The WHO stated that it was 'deeply concerned about the potential negative consequences' of the research.[10] In January 2012 it requested a 60-day moratorium to suspend such research during which time the WHO member states were asked to consider what approaches and decisions (if any) should be taken. Some observers and analysts have expressed concern that such work unnecessarily risks the accidental release from a laboratory of a modified virus, or that such work might suggest to states and non-state actors unorthodox avenues for biological weapon attack. Conversely, observers and analysts have argued that it is important to better understand the mechanisms by which influenza viruses become readily transmissible among humans.[11] There were further disagreements regarding whether and how the research proposal could have been modified to make it less 'proliferation sensitive'.

DNA recovery and sequencing from deteriorated ('ancient') and novel specimens are becoming increasingly common, mainly due to rapidly improving capabilities to extract, duplicate and sequence minute and ancient DNA samples. Such work yields greater insight into the function of pathogens and the nature of associated virulence factors. On 12 October 2011, *Nature* published a draft genome of *Yersinia pestis* (the causative agent of plague) that was derived from victims of the Black Death, dating

[9] US National Science Advisory Board for Biosecurity (NSABB), 'National Science Advisory Board for Biosecurity Recommendations', 21 Nov. 2011, <http://www.aaas.org/news/releases/2012/0120sp_flu.shtml>.

[10] World Health Organization (WHO), 'WHO concerned that new H5N1 influenza research could undermine the 2011 Pandemic Influenza Preparedness Framework', Press statement, 30 Dec. 2011, <http://www.who.int/mediacentre/news/statements/2011/pip_framework_20111229/en/index.html>.

[11] In birds, the A(H5N1) strain is principally a gut disease that is shed through faeces, while in humans the strain is principally found in the lungs, nose, and throat and shed through mucous and saliva. Scientists have found that a change in the PB2 gene facilitated virus reproduction at a temperature 4 degrees Celsius lower than the temperature in the guts of birds. Birds and humans also share similar cell receptors (alpha 2,3 and alpha 2,6, respectively).

from a strain associated with plague deaths in London in 1348–50. The samples were taken from the teeth of victims, and DNA from current *Y. pestis* strains was used as a complementary template to the historical strain. Analysis of the genetic structure of the strain, including its phylogeny, 'reveal[s] no unique derived positions' as compared to those currently found in nature and, thus, 'factors other than microbial genetics, such as environment, vector dynamics and host susceptibility' should be the focus for analysis of the epidemiology of the bacterium.[12] The researchers sought to understand why the strain that caused the Black Death was so virulent. The possible reasons include (*a*) yet to be understood aspects of how the genes are structured in the chromosomes, (*b*) the possible greater susceptibility of the population of 14th century Europe to the bacterium, and (*c*) a combination of environmental factors—including extended periods of warmer, wet weather, as well as the proximity of humans to rodents and unsanitary living conditions, both of which were more common at the time. One of the principal researchers, Dr Hendrick Poinar, underlined the fast pace of change in science and technology (S&T) by observing that scientists would have been 'unlikely' to be able to extract the genome in 2009.[13]

Future implications of science and technology

The current and future S&T environment poses several difficult questions for CBW arms control, including what is an 'activity of concern'; what is the appropriate policy response with respect to both general S&T trends and developments and possible future specific activities that may require regulation and other governance responses; and what is the expected operating environment of the 1972 Biological and Toxin Weapons Convention (BTWC) and the 1993 Chemical Weapons Convention (CWC) in the coming 10–20 years?[14]

Many S&T advances have increased the knowledge, material and technologies that could be misused if science were to be applied for hostile purposes. Yet, on their own, they do not lead to the emergence of new warfare options. What matters is rather the context in which these scientific activ-

[12] Schuenemann, V. J. et al., 'Targeted enrichment of ancient pathogens yielding the pPCP1 plasmid of *Yersinia pestis* from victims of the Black Death', *Proceedings of the National Academy of Sciences*, vol. 108, no. 38 (20 Sep. 2011), pp. E746–E752; and Bos, K. I. et al., 'A draft genome of *Yersinia pestis* from victims of the Black Death', *Nature*, vol. 478 (27 Oct. 2011), pp. 506–10.

[13] US Public Broadcasting Service, 'Reconstructing Black Death: why was plague microbe so deadly?', Interview of Hendrick Poinar by Ray Suarez, *Newshour*, 13 Oct. 2011, <http://www.pbs.org/newshour/bb/health/july-dec11/blackdeath_10-13.html>.

[14] Partly based on Hart, J. and Trapp, R., 'Science and technology and their impacts on the Biological and Toxin Weapons Convention: a synthesis report on preparing for the Seventh Review Conference and future challenges', SIPRI, Dec. 2011, <http://www.sipri.org/research/disarmament/bw/publications/btwc111212.pdf>. See also UN Office at Geneva, 'Disarmament: think zone for the Seventh Review Conference', <http://www.unog.ch/bwc/thinkzone>.

ities are carried out. For example, threat assessment and biodefence programmes (depending on how they are structured and implemented) can, if conducted with a lack of sufficient transparency, raise concerns among other states or actors regarding their legitimacy or intent. This, in turn, can destabilize the BTWC and the CWC regimes. However, it is not the nature of the research itself that should be the focus of clarification and evaluation by states. While monitoring scientific activities can assist in the identification of new discoveries or research activity, what is most important is an in-depth evaluation of their implications for the convention regimes. In particular, states should understand whether these new scientific activities and discoveries could lead to paradigm shifts and, therefore, call for new approaches and responses in CBW arms control. This can be done by states (both individually and collectively) in the context of the BTWC and the CWC regime meetings. Any S&T evaluation mechanisms should be systematic and participatory in nature.

With regard to policy responses to S&T trends, the nature of science calls for a combination of top-down regulation based on the principles and norms of the BTWC and the CWC, and a bottom-up approach of self-regulation and voluntary measures to increase transparency and strengthen responsible conduct in research and development activity. Interaction between governments and regulators, on the one hand, and science and industry, on the other hand, is also important. Scientists need to have the freedom to carry out research and publish new discoveries and methods. Industry requires a predictable and fair environment in which to conduct science while complying with the BTWC and the CWC norms and the various relevant mechanisms to resolve compliance issues vis-à-vis other parties to these conventions. The entire exercise is both multidisciplinary and driven by the overlapping interests and responsibilities of governments, private enterprise and the science community. Effective chemical and biological arms control calls for a combination of a traditional regulatory approach and the more fluid networking solutions that bring together a wide range of actors.

It is difficult to predict the future operating environment of the two conventions. The focus of concerned practitioners and policy analysts should be on major trends and ‘drivers’, many or most of which can be readily identified today. For example, as the cost of key enabling technologies (e.g. computing, synthesis and screening) drops and the international capacity to utilize them increases, traditional distinctions between ‘donors’ and ‘recipients’ of technology transfer will become increasingly irrelevant. The world is already living in a ‘post-proliferation’ environment that is characterized less by the spread of weapons, and more by increasing accessibility to and capacity for work in S&T.

Despite the inherently subjective (qualitative) nature of CBW threat assessments, scientists and technical experts working for states, in principle, understand such threats—provided their national structures are oriented to take such threats into account. Non-state actors—'terrorists' and the proverbial garage science operators—lack institutional depth and capacity to achieve similar levels of sophistication or output. Another key ('chicken and egg') conundrum is whether threat pronouncements—often made by those who are not conducting scientific research and development—prompt al-Qaeda affiliates (or their equivalent) to consider or to pursue the acquisition of chemical and biological weapons.[15]

Broader challenges include the extent to which threat perceptions are driven by actual interest and activity by non-state actors; whether and how the deliberate spread of disease constitutes a weapon of mass destruction; and whether states can achieve absolute security, or rather prioritize the attention and resources devoted to a variety of threats (qualitatively or quantitatively) according to a 'reasoned and balanced' hierarchy of risk. Prioritization implies that decision makers and policymakers (and the public more broadly) can tolerate a degree of ambiguity.

[15] Stenersen, A., *Al-Qaida's Quest for Weapons of Mass Destruction: The History behind the Hype* (VDM Verlag Dr Müller: Saarbrücken, 2008), p. 29.